WHAT ADVICE SHALL WE GIVE TO OUR GRADUATES?

It would seem that, regardless of the nature of the curricula, the main job of an agricultural college is to give students a real university training, comparable to that given by any department in a university: so that regardless of whether or not they pursue agriculture upon graduation they can think independently, and will become real students of the work they undertake.....

University graduates in agriculture, and also graduates of other colleges will and do return to the soil, and engage in farming, if they like agriculture and have sufficient capital to farm in such a way as to give them an adequate living. But why stir up the undergraduates and recent graduates to a desire which in too many cases leads to disappointment? Why not give them a good university training in their chosen field, and wish them well in any field of endeavor they may choose to follow.

Through agriculture, students can be well and broadly educated. We need more leadership, more business in farming, less subsidy and paternalism. Let us make our curricula conducive to independence, good citizenship, and clear thinking. We know the graduates will have agriculture at heart, and when capital and opportunity permit, coupled with a desire to engage in agriculture, they will return to the soil.—THOMAS TAVERNETTI, *Assistant to Dean, College of Agriculture, University of California.*

—*Quarterly of Alpha Zeta*

DOES AN AGRICULTURAL COLLEGE EDUCATION UNFIT A MAN FOR FARMING?

Such lines of work as teaching, extension work, and a number of others, require men who have been college trained, so that groups who do not go back to the farm are pursuing professional work which is very necessary, and for which only they are fitted.

More and more, agricultural colleges are fitting in the practical side of agriculture with book learning. Consequently, the old familiar argument that college "just gives a man book learning and nothing else," must be passed into discard along with such theories as planting potatoes by the sign of the moon. Not only does college give a man the practical side of farming from the standpoint of management and cultural practices, but it teaches the principles of economics, a little psychology and many other

sciences which one has to know something about in order to keep abreast of the ever increasing knowledge of other classes of people.....

When one has a basis such as this, why should he not be able to become a farm leader? The argument will be advanced that all this education, together with the social advantages which are such a necessary part of college, have caused him to lose interest in the farm life, with its long hours of hard work. Perhaps this may be the case with some. If so, well and good, because they are better off away from the farm, and the number included in this group is not so great compared to the total farming population. If these people have minds adapted and trained for research or are particularly adept in teaching or extension work, they will do more for the farms than by settling down somewhere and actually running a farm. So long as a fair percentage of the college graduates return to the farm, there is no cause for worry. The writer has yet to see a man who after completing an agricultural college course has returned to the farm who has not made good, although there are doubtless some.

There is one main reason why students do not return to the farm at once after completing college. They do not have a suitable farm available and do not wish to embark in farming without capital, so they enter other lines of work. Many of them eventually go back to the farm as soon as they have accumulated sufficient for a proper start.

—*Quarterly of Alpha Zeta*

RE THE FINANCIAL CONDITION OF THE TAO LET US LOOK IN THE HORSE'S MOUTH!

"Many years ago in Italy, when the convents of the Middle Ages were the repositories of human knowledge, a party of monks were arguing about the number of teeth in the mouth of the horse. Arguments were many and heated, numerous musty old tomes were opened, and references to authority frequent and conflicting. Finally one clever young monk—and what a brilliant mind to conceive it—suggested that they all go out and LOOK IN THE MOUTH OF THE HORSE! Here was the first exponent of the "case method of investigation"—the only truly scientific method—and a man to whom a monument should have been erected."

There are near 10,000,000 of the tao class in the Philippines. They represent the great majority of the Filipino people. All with first hand knowledge of the subject agree that their economic condition is an unsafe one, and a constant and growing danger to the whole economic structure of this country and people. Agrarian problems now press upon us. Many remedies have been suggested and some tried without general success. Much talk has been had and many opinions have been expressed. *Only two or three isolated efforts have been made to actually "look in the horse's mouth!"*

We press the fundamental importance of a comprehensive detailed survey of the whole question, by men *thoroughly equipped* for investigation in *agricultural economics* and pray that this may be actively set under way at the earliest possible date.—CHARLES FULLER BAKER.

CATTLE RAISING UNDER PHILIPPINE CONDITIONS[1]

VALENTE VILLEGAS
Of the Department of Animal Husbandry

REVISED BY B. M. GONZALEZ

WITH SIX TEXT FIGURES

There is at present great interest in the Philippines in cattle raising, and with the improvement of marketing facilities and a consequent betterment of prices many more people may be expected to engage in the industry. The operation of a cattle ranch is comparatively simple, and reasonable profits may be confidently expected from investment put into such a business, but the ranchman must put his knowledge into actual use at all times to insure success. As a number of enterprising beginners who do not possess the necessary training and experience in the work are lured into cattle raising, this article was prepared with the hope of helping them in their early efforts.

SELECTION OF SITE

Cattle raising can be carried out best in places where large tracts of cheap land are available, as in sparsely populated and in hilly and mountainous regions. Such areas are usually low in fertility or otherwise unfit for intensive crop farming. The area should be fairly high, well-drained, and traversed by one or more small streams or rivers to serve as natural watering places. If streams are absent, provision should be made for the watering of the stock artificially by means of wells and pumps. It is possible in some places to dig deeper natural drainage ponds where water tends to collect and utilize these as watering places.

On the whole, however, an area without a steady water supply cannot be considered as a good location for a cattle ranch. A more or less uniform distribution of rainfall is desirable and very important in maintaining a regular supply of pasturage, which should consist of palatable and productive grass species. Too much rainfall, however, during the colder months of the year is prejudicial to the health and well-being of the animals.

SIZE OF INITIAL HERD

For a beginner who intends to raise cattle under range conditions, an initial herd of not less than 50 breeding cows is recommended. With more

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capital one may start on a herd of 100. There is an advantage in starting on a small scale, as the rancher is enabled to acquire knowledge and experience with a greater chance of success and less of loss, since his problems are relatively simpler if his herd is small. It is not wise to start with fewer than fifty animals. A smaller herd does not warrant a man's devoting his full time to the enterprise and the business probably will be conducted in a haphazard manner, resulting in loss rather than in profit.

KINDS OF STOCK

The exclusive use of the usual run of native animals for the production of market cattle generally gives poor results, as native animals are as a rule too small. Highly selected native cows may be expected to produce superior animals and these may be used as the foundation of the herd. The Nellore cattle of India have acquitted themselves most satisfactorily in improving the native animals under Philippine conditions, and good bulls of this breed may be used to mate with the native cows.

The use of Nellore bulls on native cows produces larger animals than the native, more active, hardier in constitution and to a certain extent more resistant to rinderpest, foot-and-mouth disease, and ticks. But if more than half Nellore blood is allowed in the grades certain undesirable qualities manifest themselves, such as viciousness, intractability, legginess, and narrowness of body. To counteract these tendencies a low-set, stocky, and docile type of cattle should be employed. Bulls from beef breeds such as the Hereford, Shorthorn, and Galloway may be used to counteract the defects imparted by the Indian breed, but they are not as hardy as the Indians and this defect is equally transmitted to the offspring.

SELECTION OF BULL

The bull makes up one-half of the blood composition of its progeny in a herd, but in practice a well selected sire, because of his superiority, exerts a greater and more marked influence in improving the quality of his offspring. Therefore, it is very important that the right type of bull be chosen for the herd.

The Philippine market demands a good-sized animal that will be useful for either beef or for work, or an animal that can be used for work first then butchered afterwards for beef. Briefly, an animal of this type should be big, low-set, well-muscled, tractable, active, and strong. Native bullocks from Batangas Province and half-blood Nellore-Native steers will usually classify under this group.

Nellore bulls are often narrow, upstanding, spare, and leggy. Animals that are extreme in these characteristics should be discriminated against. The weight should not be less than 500 kilograms at maturity. Gray or white color is preferred. The characteristics of the animal should be markedly masculine. The testicles should be well-developed and well let down.

The head should show ruggedness, and the neck, shoulders, and hump should be thick and muscular. Prominence and good development of the hump give evidence of masculinity. The bull should be active and aggressive. All these features indicate good breeding ability, necessary for the production of uniform, superior offspring.

If native or grade bulls are to be used, they should be not less than 400 kilograms in weight. The color should be solid of any shade.

SELECTION OF COWS

Less stringent rules may apply in the selection of cows. But to disregard their merits and depend wholly on the superiority of the bull to correct

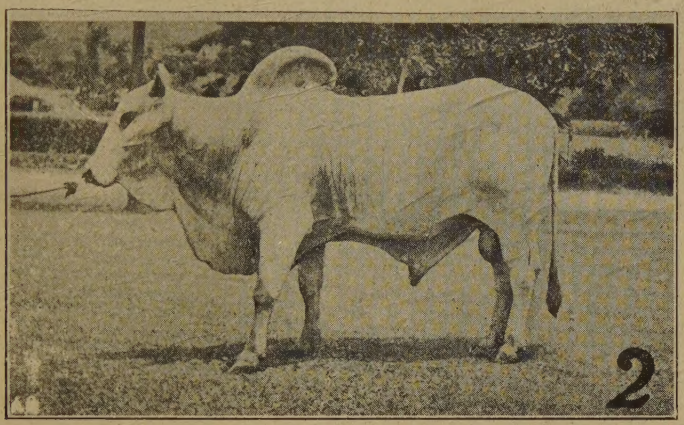

Fig. 1.—A pure-bred Nellore bull possessing depth and roundness of body suitable for grading up native cattle. Note masculinity shown by ruggedness of head, prominence of hump and hanging dewlap.
Weight 591 kilograms, height 140 centimeters.

all deficiencies in conformation and other characteristics is fallacious. The dam contributes as much blood as the sire in the composition of the progeny.

The use of native animals as foundation cows is economical and practicable, as they are available at nominal prices. Another advantage in using native cows is that they are prolific and fairly well adapted to local conditions. However, because of promiscuous breeding among them, their size and conformation is oftentimes very poor. To build up a herd of good quality, cows weighing less than 250 kilograms should not be used for breeding.

Besides good conformation, the development and instincts of the cow should be taken into consideration. These should be typical of her sex. Together with strong constitution as shown in the good development of chest and barrel, the hindquarters should be wide, deep, long, and level,

features that are conducive to the normal delivery of well-formed fetus. The udders and teats should be of large size. The cow should have a mild maternal face, for such animals generally tend their calves well.

Heifers from two to six years old should be selected in order that their period of usefulness may be longer. Whenever possible, heifers with calves or in calf should be secured, as this constitutes a guarantee of fertility and affords an opportunity to observe the ability of the dam to raise its young. In exceptional cases, old cows which are known to produce regularly good offspring may be purchased for breeding purposes. Calves from such cows are likely to inherit the good performance of their dams.

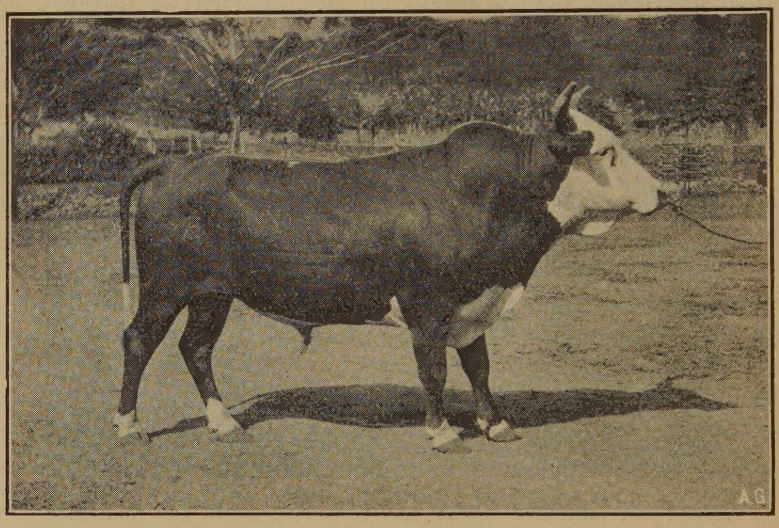

Fig. 2.—A grade Hereford bull. Low in stature but wide, deep, long, and meaty. Because of the Hereford blood early maturity, blockiness and meatiness may be transmitted to its offspring.
Weight 440 kilograms, height 125 centimeters.

HERD MANAGEMENT

For the best results, cattle on a large ranch may be divided into four main herds, as follows:

1. Breeding herd
2. Pure-bred herd
3. Heifer herd
4. Bull and steer herd

Breeding herd. This herd consists of breeding cows, bulls, and calves. Dry cows and cows with calves should be kept in this herd. The calves should be allowed to remain up to about six months of age or a little over, before they are weaned out. Breeding bulls are placed in this herd at the rate of one bull for every 25 to 30 cows. This being the largest herd, the animals should be placed in the best and most extensive pasture.

The herd should receive careful and close supervision on account of the calves, both the newly born and the others. The herdsman should make daily inspection of the herd. When a new calf is born it should be caught and the ear notched to indicate the year in which it is calved. Records of the sex and color of the calf and brand number of the dam should be recorded. Calves that are born weak, especially during bad weather, should be taken with the mother to the barn and kept under shelter until they are strong enough to stand conditions in the open pasture. Sometimes the raw navel of a newborn calf will be infested with maggots. In such cases the calf and dam should be taken to the barn for treatment. Calves that are disowned by their dams, or orphaned, may be raised by hand on other cow's milk.

At the taking of inventory, which is done at least once a year during the time of castration and branding, cows whose calving records show that they have failed to produce for two years or over should be eliminated from the herd and sold as butcher stock. Normally, range cows are expected to calve once a year. If the highest breeding efficiency of the herd is to be attained, animals that are abnormally defective in appearance, cows that habitually abandon their calves or disown them, and dams that repeatedly abort or produce dead or weak calves should be disposed of. A breeding efficiency of 75 per cent, that is, to produce 75 calves out of 100 breeding cows, is considered a high standard. Such bulls in the herd as are old and inactive breeders or are naturally passive and indifferent should be castrated and sold for slaughter.

Pure-bred herd. The purpose of the pure-bred herd is to supply the ranch with the necessary bulls to be used in the breeding herd to produce market animals. The maintenance of this herd is warranted only on large ranches where the demand for breeding bulls is great. Besides being more economical to produce pure-bred bulls in the same ranch, it is far more satisfactory to produce them according to the rancher's own ideals of breeding. On a small ranch, pure-bred cows may be kept and mixed in the breeding herd to produce pure-bred bulls for the ranch. Surplus pure-bred bulls that are produced beyond the number needed by the ranch, or individuals that are discarded because of certain defects, may be disposed of as market animals.

Heifer herd. At weaning time, when calves of about six or eight months of age are separated from their dams, the heifers should be placed in a separate pasture. These animals should be allowed to grow unbred to the age of one and one-half to two years when they should be transferred to the breeding herd. The separation of these heifers from the breeding herd, while entailing extra expense in fencing and herdsmen's time, pays through the uninterrupted development of the animals. It is common knowledge that heifers bred very early become stunted and are likely not to reach the full development they would if breeding were delayed.

Heifers should be placed in a strong-fenced pasture far from other herds. If close to the breeding or pure-bred herd the weanlings are likely to break through the fence seeking their mothers. If placed close to the bull herd the bulls are apt to break through the fence and breed the heifers.

Steer and bull herd. The steers may be mixed with either the bull herds or the heifer herds. It is, however, advisable that the steers be placed with the bulls so as to form a fair-sized herd. Usually if steers are mixed with heifers the herd becomes unreasonably large. There is also uniformity in the appearance of a herd when bulls and steers are placed together. Furthermore, in practice it is difficult to distinguish between

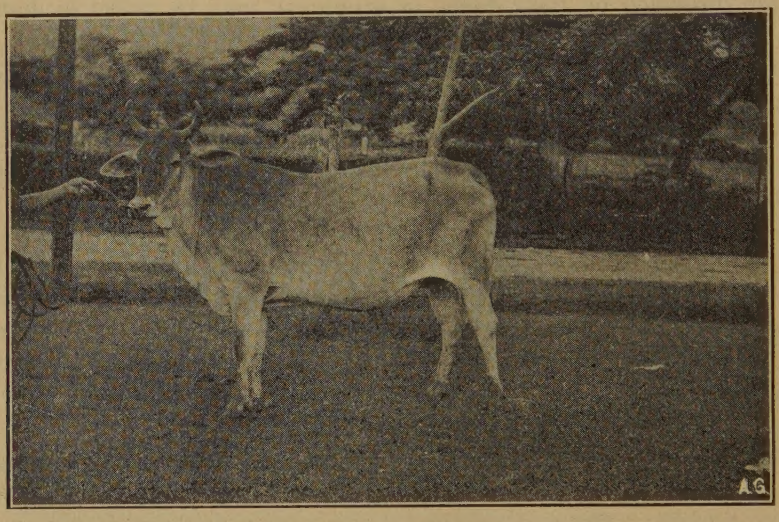

Fig. 3.—A grade Nellore cow of desirable type. Tall and long, yet with deep and round body.
Weight 344 kilograms, height 122 centimeters.

weanling castrates and entires and when steers are separated from the bulls and placed with the heifer herd some bulls are likely to be put in the herd.

From the steer and bull herd, market animals are obtained. These may be breeding bulls, work stock or slaughter steers. The herd serves also to grow breeding bulls for the ranch. To get the maximum service from these bulls, they should not be used until they are about three years of age. Work and slaughter steers attain marketable weight between three and four years of age. Breeding bulls for sale are in greater demand when they are young when the price is relatively low.

Bulls that do not sell because of poor type, conformation, size or other defects should be castrated and sold as work animals or for slaughter.

The market value of work steers is augmented about 20 per cent if they are broken to work. It will pay to employ extra men, if necessary, to train them. They may be trained both for the plow and cart.

Cattle, particularly butcher stock, are best marketed on the basis of weight. For this reason it is very important that ranches be equipped with stock scales. Pit scales are recommended for large establishments; they are possibly more durable although more expensive than the pitless kind. On small ranches a portable scale with a weighing capacity of 300 kilograms or over may be employed. The total weight of the animal is obtained by adding the weight of the front to that of the hind legs of the animal. The animal should stand level, and for this purpose a platform should be provided of exactly the same height as the weighing floor of the scale. Animals that are fairly docile may be weighed in this manner.

QUARANTINE PASTURE

An isolated pasture, far from any of the main herds, should be set aside for quarantining sick as well as newly purchased animals. A shed may be constructed in this pasture. All animals on the ranch that contract infectious diseases should be confined in this pasture. Likewise, new stock from outside should first be quarantined here before they are mixed with the main herds. The period of quarantine should be about one month and animals that show no symptom of disease at the end of that period may be pronounced healthy.

SALTING

Common salt is necessary for the proper utilization of the feed and for other bodily needs. Animals failing to get an adequate supply of this mineral are restless, out of condition, and develop a rough coat of hair. About one kilogram of salt daily may be allowed for every 100 head of cattle. It may be given at inspection time by pouring on dry ground and distributing it at different spots to prevent overcrowding. The herdsman will do well to adopt a call—as "asin" (salt)—to bring the animals together at one place at salting time. The animals soon learn to respond and rush to the place where the herdsman is. By enticing the animals to lick salt from one's hand they become tame and approachable.

RECORDING OF BIRTHS

One of the important items of routine work in cattle management is the recording of births. By making this record, the actual production of the ranch and the breeding efficiency of the cows are known. The age and sex of calves born are also obtained.

The practice of recording births followed on Diklom Ranch, Bukidnon, may be suggested: The herdsman is equipped with a pair of scissors when he goes out to inspect the herds. New births, recognized by the absence of marks, are caught and the ears slit according to the year in which they were born. For example, a slit on the tip of the right ear may be taken for 1927 births. Different marks may be adopted for other years, depending on the

position on the ear and whether it is right or the left. At weaning time the abbreviated figures for the year, as "27" for "1927", is branded on the arm of the animal. This serves as a guide in telling the age of the animal at first glance, when they are marketed or for other purposes.

A disadvantage in leaving calves unmarked in a large herd is that such calves may be recorded at different dates as new births, thereby making the numbers of animals inaccurate in the herd. Also, wrong dams of older unmarked calves may be recorded, as older calves roam a great deal, some of them remaining close to cows other than their mothers which may be taken as their dams. Some cows even allow outside calves to suckle from them.

In a small herd the calves may be marked to indicate their herd numbers; these are afterwards branded either back of the thigh or on the arm. For this purpose an ear notcher is necessary. The diagram shown in figure 4 is recommended; it shows the corresponding numbers pertaining to the

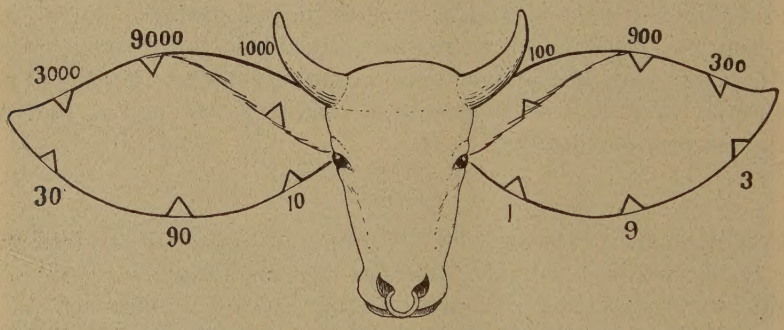

Fig. 4.—Diagram showing numbering of notches on ears.

notches possible on both ears of the animal. By combining a number of notches, any number may be produced.

WEANING

Calves are weaned at the age of six to eight months. By this time they are so mature that they can be separated from their dams without injury to their health and condition. Also, by this time the udders are beginning to dry up so the cows suffer no injury when the calves are separated from them.

It is important that weaning be done in due time; otherwise, the young bulls will begin to breed. Young heifers are also likely to be bred at a very early age. Besides, delay in weaning these calves means increased difficulties in separating and catching them, and in branding and castrating.

Weanlings are separated from their dams outright and placed in a corral made with a tight and strong fence, preferably of woven wire. Barbed wire for fencing weaning corrals is objectionable inasmuch as it is likely to cause injury to fretful and restless calves seeking their mothers during

the early period of weaning. The calves should be placed in the corral for about 15 to 20 days; at the end of this period they will have forgotten their dams and may be placed in the herds to which they properly belong.

Simultaneous with the weaning operation all calves are branded and the males which are not wanted for breeding should be castrated.

Castration. There should be on the ranch one emasculator, one scalpel or pocket knife, or even more, creoline, pine tar, and cosmoline. A piece of rag or cotton is necessary to cleanse and swab the scrotum before and after the operation. Several lariats are needed for catching and casting the animals.

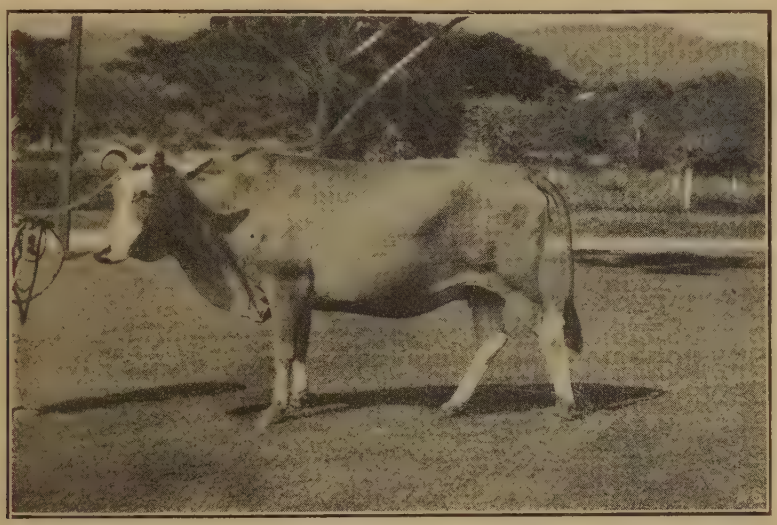

Fig. 5.—A choice cow of native breeding. Of good size, symmetry, and constitution.
Weight 318 kilograms, height 112 centimeters.

Range animals are caught by the head with the lasso and thrown down by pulling on the rope placed around the hind legs. On large ranches cowboys on well-trained ponies are used to facilitate the work of catching and casting. When the animal is cast it may be held in place by one man holding down the head and another seating himself behind the hindquarters so that the upper hindleg is held and stretched backward and the under hindleg pushed forward by one of the man's legs. Large and strong weanlings which cannot be subjected to this method of restraint are hogtied; that is, the four legs are tied together, before they are castrated.

Proper disinfection with creoline solution should be made before and after the operation. Calves with testicles small and undeveloped that are castrated young may be unsexed without the use of the emasculator. With a knife the scrotum is cut through including the inner membrane, and the

testicles are squeezed out. These are pulled out and the spermatic cord is torn off with the fingers. The end of the scrotum may also be capped out and the inner membrane cut through before the testicles are removed. Then the calf is turned loose. During fly season a mixture of pine tar and vaseline should be applied on the wound as fly repellent. If the spermatic cord is well developed the emasculator should be used in severing the cord. It should be held for a while before releasing it so the edges of the spermatic cord may be crushed and the blood allowed to clot and thus prevent profuse bleeding.

Branding. During the castration operation the weanlings may be branded. The law requires two brands: the municipality brand placed on the right hip and the owner's brand on the left hip. On well-managed ranches two other brands are recommended; namely, serial numbers on one of the arms indicating the year in which the animal was born and herd numbers branded on the hind part of the thigh.

Copper, although expensive, is the best material for branding irons as it retains heat for a long time and does not rust. However, iron branding irons serve the purpose satisfactorily enough and may last long if allowed to cool gradually after use and if kept oiled while in storage. The parts of the branding irons may be 5 millimeters thick and 14 millimeters deep. A height of 10 centimeters for letter brands and 7 centimeters for numbers give good results. Avoid sharp corners on brands by rounding them or disconnecting. Owner's brand should be simple and plain, so that a clear-cut, legible imprint is left on the skin of the animal after branding. Cumbersome and intricate brands produce blurred figures and burn the hide unnecessarily.

Good results are obtained by heating the brands red hot before application. The hide must be scorched before removing the iron. Wet or soiled skin must be cleaned and dried before branding. No medicine should be applied on the brand as otherwise it will heal clean and leave a very obscure mark.

Cattle may be rounded up for weaning, castration, branding, and inventory any time from January to May of each year. Climatic conditions at this time are more favorable to carry on all-day work and for the healing of wounds resulting from castration and branding. This season is also free from flies which are always a menace to the proper recovery of castrated and branded animals. Calves weaned in this season thrive better than during the rainy season provided enough grass is available in the pastures where they are kept.

COMMON AILMENTS

Only minor troubles affecting cattle will be discussed in this paper. Also, only remedies which have proved most practical and economical are indicated.

Navel infection. On the range, navel infection is common during damp weather. During fly time navel wounds may be seen unduly swollen and infected on account of the maggots infesting the tissues. Calves affected with this infection stamp on the ground with their feet. They are also restless and irritable if the sore is aggravated and large. To prevent serious cases of navel infection, calves found so infected should be caught at once and the navel disinfected and painted with tincture of iodine. With an advanced case, both mother and calf should be caught and taken to the barn. Here the calf should be thrown down and the maggots removed by killing with drops of creoline and picking them out with pincers afterwards. The wound may then be disinfected and dusted with calomel regularly until dry.

Wounds and scratches. From various causes, as goring one another, injuries caused by hard objects in the pasture, etc., wounds and scratches are very common in a herd. Such injuries if neglected may become infected, and turn into chronic suppurating sores. Mr. Florentino Cruz, Superintendent of the Nellore Ranch, in Bukidnon, employs a method of preventing infection which gives satisfactory results. The herdsman on his daily rounds with the herds carries a pole at the end of which is attached a swab soaked in pine tar. Any scratch or wound found on an animal is painted with pine tar. This keeps the flies off and disinfects the wound so that no injury becomes serious and healing takes place readily. In the case of chronic sores or large wounds the animal is caught and taken to the barn and placed in a stock or cast and the dead tissues of the wound cut off. The wound is then cleaned and disinfected and calomel or iodoform applied. This treatment may be repeated regularly until the wound is completely healed.

Eye sores. Eye sores may be caused by fly bites or result from physical injury. They are shown by swollen and watery eyes. Any neglect may lead to infection and blindness. The animal should be taken to the barn and placed in a stock and the head held firmly in place and the eyes cleaned with boric acid solution. A little calomel in a funnel of paper is then blown directly into the eyes.

Ear sores. Flies like to feed on the excretions inside the ears of cattle and during fly season the bites made may be so general that the sores become a suitable medium for maggots to feed on. Infection usually takes place and a foul odor is produced. If not attended to in due time the sore may implicate the deeper tissues and form an abscess which may turn chronic and suppurating. The animal affected should be placed in a stock and the wound irrigated and cleaned thoroughly with disinfectant and the maggots removed. Then calomel or iodoform should be dusted on the sore and pine tar painted on the outside to drive off flies.

Warts. Warts may develop on animals on the range and besides making them look unsightly may annoy them. When only a few small outgrowths are present they may be removed by cauterizing with caustics. Large warts are pared off with a knife and the wounds burnt with caustic.

Weak calves. Mothers poor in constitution or ill-nourished and old cows may produce weak offspring. During the stormy and wet season of the year some calves do not stand unfavorable conditions and therefore weaken. Then there are a few cows that do not produce enough milk for their calves, so they become stunted and unhealthy. Different calves require special treatment, but as a rule they thrive better if placed under shelter and given additional feed. Very young calves will improve on additional milk from other cows while older calves will fatten on cracked corn and rice bran.

Orphaned calves may be raised successfully. A calf is first taught to drink milk from a pail by coaxing it to suck one's finger, and then lowering it in a pail containing milk. Once taught to drink from a pail the danger

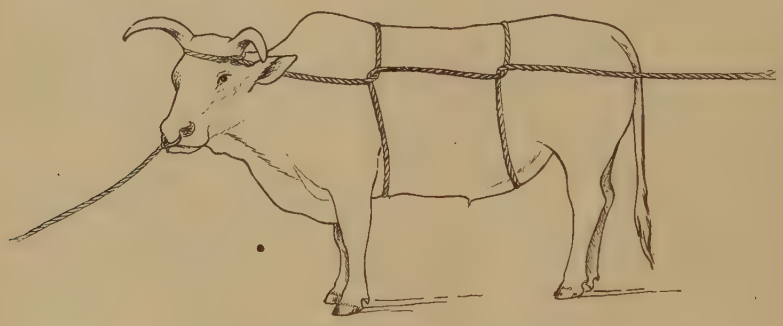

Fig. 6.—Device for throwing down a steer.

lies in overfeeding the calf. As a rule, three to five kilograms of milk daily is sufficient. Feeding may be done three times a day until the calf is three weeks old, after which it may be reduced to two times daily. As soon as the calf is about two months old a mixture of cracked corn and rice bran may be given in such amounts as it will consume readily each feeding. At about four months of age, milk feeding may be gradually eliminated. Fine palatable grass should be placed before the calves all the time as soon as they will take it.

PASTURE MANAGEMENT

The ranch may be divided into as many or more pastures as there are herds. Ranching in regions of limited extension may be regulated by alloting two or three pastures for each herd for rotation purposes. Greater efficiency of the pastures are obtained in this way besides the chance of the pastures becoming infested with parasites and disease is reduced.

Cogon (*Imperata cylindrica* Linn.), bagocboc (*Andropogon nitidus* (Vahl) Kunth) are the most abundant range grasses in different regions of

the Islands. Other grasses that are found in abundance include talahib (*Saccharum spontaneum* Linn.), aguiñgay (*Rottboelia exaltata* Linn. f), aguiñgay babae (*Andropogon halepensis* var. *propinquus* Kunth), carabao grass (*Paspalum conjugatum* Berg.), and amor seco (*Andropogon aciculatus* Retz.). All these grasses are suitable cattle feed although cogon and talahib require burning over or mowing before cattle relish the new shoots.

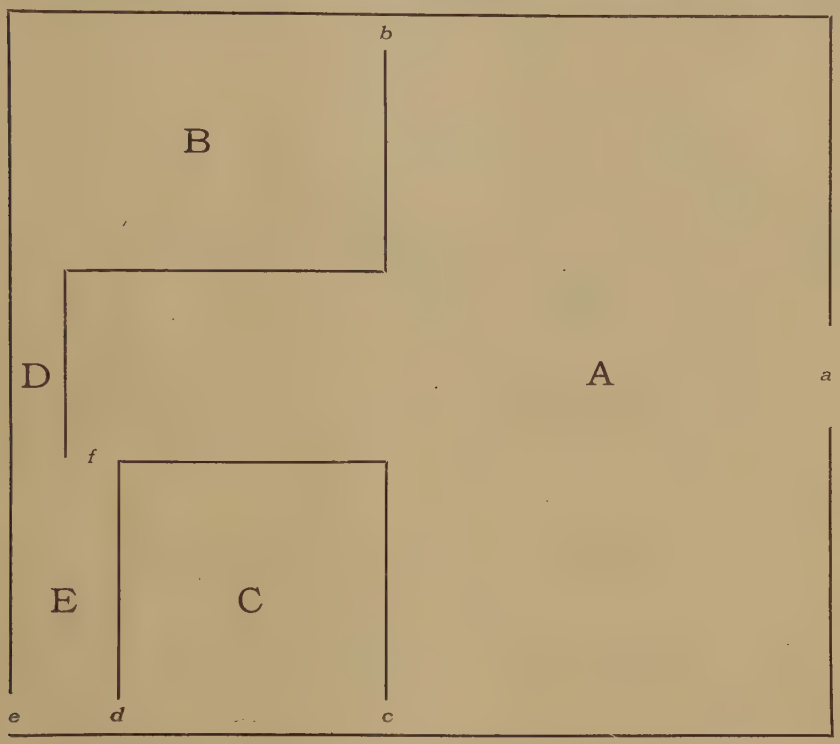

Fig. 7.—Diagram of a separating corral. How to use: Let us suppose that some steers are wanted for sale. The herd is driven through door *a* into corral *A*. If the herd is small all animals may be driven into corral *B* through door *b*. One by one the animals are driven through chute *D*. Steers that are wanted are driven into corral *C* by first closing doors *e* and *f* and opening door *d*. Any other animal may be driven out into the pasture through door *e*. On the other hand, if an animal other than steers is wanted for some reason, for example, a diseased animal which requires treatment, it may be driven back into corral *A* through door *f*.

The scale for weighing purposes is placed at the middle of chute *D*.

The growing of carabao grass should be encouraged. It is productive and palatable. It is easily propagated by seed and thrives best on moist slopes and under trees.

Of the foreign grasses, Natal grass (*Tricholaena rosea* Nees) adapts itself well on pastures and spreads rapidly from the seeds blown by the winds. The grass is readily eaten by different classes of animals, although it is not very productive.

On ranges which suffer from drought, the shortage of forage supply may be obviated by storing grass hay during seasons of abundance. A mowing machine drawn by work bullocks may be used in cutting grass.

In dividing the ranch into sections, wooded hills, mountains, and rivers may be used as boundaries or partitions between pastures. No fences are necessary in such cases and a great saving is effected. Strong and satisfactory fences can be made with three barbed wires nailed on posts three meters apart. Ipil-ipil (*Leucaena glauca* (Linn.) Benth.), anonang (*Cordia dichotoma* Forst. f.), madre de cacao (*Gliricidia sepium* (Jacq.) Stend.), and bamboo butts may be used as posts. These posts are cut two meters long and are placed in the ground 60 centimeters deep. The lowest wire is placed 35 centimeters above the ground, the highest 1.40 meters, and the middle strand closer to the lower wire than to the upper. To construct 100 meters of barbed wire fence using ipil-ipil or similar posts will cost, under Los Baños conditions, approximately twelve pesos. Such a fence may last for one and a half years with little repair. Madre de cacao posts if set during the rainy season take root readily and may extend the life of the fence considerably.

Catching and weaning corrals require a strong and smooth fence. For these, woven wire, 47 inches high, is used. The posts are set at the same distance and depth as with barbed wire fence. Using wooden posts, the cost of putting up 100 meters of this fence, under Los Baños conditions, is approximately 39 pesos.

The carrying capacity of the pastures may be estimated at a maximum rate of one animal to the hectare. Such a maximum may be possible in fertile grasslands with regular rains and the vegetation maintained properly by rotation, well-regulated grazing, and weeding. The animals should be allowed to graze close enough to increase the growth of more young shoots and yet not so close as to permit weeds to gain headway and crowd the grass. With poorer pastures, greater areas will be necessary to maintain an ox throughout the year, much depending on the climate of the region and availability and productivity of pasturage. In practice it is best to allow but one-half the number of cattle which may normally be carried by the ranch throughout the year. Weeds should be cut before flowering time to reduce further multiplication. Overmature and fibrous grass may be cut with a mowing machine and on hilly places where the mower can not be used properly the herbage may be burned over. Burn or mow only such areas as are needed by the animals at a time. Small woodlots on well-drained portions of the pastures are important to protect the animals from the sun's heat at midday and to provide shelter during inclement weather. On very open pastures, however, it may be necessary to build strong sheds for protection of the animals.

As many watering places as possible on a range are conducive to good health of cattle and proper utilization of the pastures. On a level open

plain, watering sites should be not more than eight kilometers apart, whereas on hilly and rougher areas the distance should be about one and one-half kilometers. Clean, pure water is essential for the well-being of cattle and with streams the source should be regularly inspected to see that there is no contamination to endanger the health of the animals on the ranch.

The gathering of cattle at night in a corral is not necessary, except for purposes of guarding them against thieves.

KEEPING OF RECORDS

The importance of keeping records of each animal on the ranch cannot be overestimated. Where there are 200 head or less, records of each animal may be taken as to herd number, sex, date calved, parentage, description (mainly as to color) and manner of disposal. With cows, the dates of calvings are also recorded to determine the performance of each animal. On larger ranches a more simple system of recording is advisable. Only the herd number, sex, approximate age and manner of disposal are important, except in the case of cows, for which the dates of calving are necessary. A permanent file of cards for recording purposes from which various data for the benefit of the ranch may be obtained is advocated.

VETERINARY SUPPLY

A list of instruments needed on a ranch is as follows:

1 clinical thermometer for temperature reading
1 scalpel for minor surgical operations, castration, etc.
1 pair of shears for trimming wounds and cutting purposes
1 artery forceps for stopping hemorrhage
1 emasculator for castration
1 fountain syringe for administration of enema
1 metal syringe for flushing wounds, drenching, and rectal injection
1 trocar and cannula for bloat and for ringing of bulls
Assorted curved needles and surgical thread for suturing purposes

Among the chemical preparations that are commonly used for medical purposes are the following:

Creoline for general disinfection purposes
Lysol or carbolic acid for special disinfection
Vaseline and coconut oil as vehicle for other medicine
Raw linseed oil, Epsom salts and Glauber's salts for purgative
Calomel or iodoform for wounds; calomel is used also for eyesores
Tincture of iodine for wounds
Tannic acid, alum for astringent
Boric acid for eye wash
Ethyl alcohol for various purposes

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THE SEED AND OIL OF JATROPHA CURCAS[1]

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WITH ONE TEXT FIGURE

INTRODUCTION

Jatropha curcas is a native of Tropical America, but it is now acclimatized and widely distributed throughout the Philippine Islands, being commonly cultivated as support for fences in urban districts of the Archipelago. It belongs to the family Euphorbiaceae. The plant is locally known as *tubang bakud* (Tagalog) or *tauataua* (Ilocano). From different countries *Jatropha* has been reported to grow rapidly and equally well in a great variety of soils and to produce an abundance of nuts which are used in a great variety of ways. In the Philippine Islands, oil is extracted from the seed by rendering and the oil thereby obtained is used for illumination. Gamble (1902) reported that in India the oil extracted from the seeds is used for illumination, and for medicine as purgative and emetic; also that the seeds are sometimes collected and sold, and that the leaves are used for feeding silk worms when there are no mulberry leaves. In the Philippine Islands it is very well known that when the seeds of *Jatropha* are eaten they act as quite a powerful purgative. Klein (1898) reports that in Tropical America and in all Portuguese colonies, chiefly in Cape Verde Island, the plant is cultivated for its fruit. He states that in Réunion the plant is cultivated as a support for the vanilla plant.

Lewkowitsch (1903) reported that the seeds consist of 66 per cent of kernels and 34 per cent of husks. The kernels yield, on extraction with ether, 52.0 per cent of oil or 34.3 per cent on the basis of the whole seed. He further states that on exposure to the air the oil changes from a pale color to yellow with reddish tints, and that 100 parts of absolute alcohol dissolve 2.17 volumes of the oil at 15.5°C. Klein (1898) found, however, that alcohol, whose purity is not mentioned, dissolved 2.41 parts of the oil, and that the oil yielded about 10 per cent of solid fatty acids. Lewkowitsch (1903) also made mention of the report of an investigator by the name of Bouis who claimed there was isocetic acid in the oil. Lewkowitsch expressed grave doubts as to Bouis' findings. The mixed fatty acids have not been studied and the exact proportions of the acids present in the oil have not been mentioned. All in all the work on purging nut oil is still very meagre.

[1] Experiment Station contribution No. 515. Received for publication, December 10, 1927.

The present investigation was undertaken to determine: (*a*) the percentage of oil in the seed; (*b*) the physical properties of the oil; (*c*) the chemical properties of the oil; (*d*) the composition of the oil; and (*e*) the composition of the seed cake and pulp.

PREPARATION OF THE OIL

The seeds used in this investigation were obtained from the provinces of Ilocos Sur, Ilocos Norte, Cagayan, and Batangas. The samples from those provinces were air dried. The first step in the process was the removal of the fruit pulp from the seeds; the seeds were then shelled and the kernels passed through a meat grinder. It was found that the fruit is composed of 58.12 per cent kernels and 42.88 per cent shells.

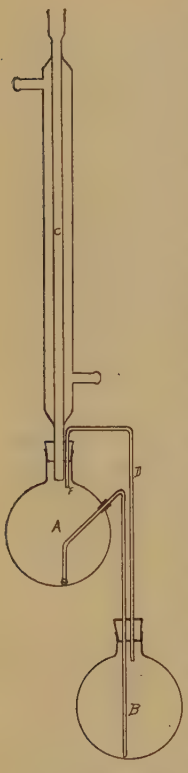

Fig. 1.—A modified Soxhlet apparatus.

The oil from a small portion of the ground kernels was extracted with ether in the Soxhlet extractor. It gave an average yield of 51.89 per cent of oil or 22.23 per cent of the whole seed. The remainder of the ground nut was placed in flask *A* (see fig. 1) and the oil was extracted with chloroform until practically all was removed. In the figure, *C* is an ordinary Liebig condenser, *B* and *A* are balloon flasks in which a bore is made in *A* about two-thirds from the bottom of the flask. *B* contains the initial solvent for extraction. The liquid in *B* is brought to boiling and the vapor of the solvent passes through *D* and comes in contact with the sample where the tubing enters *A*. Any volatilized solvent goes up to the condenser and is thereby condensed and brought back to *A*. The condensed solvent with the dissolved oil is automatically syphoned to *B* and the process is continued until the solvent accumulating at *A* before it is syphoned back to *B* is practically colorless, showing the absence of any appreciable amount of oil dissolved in it. The solvent at *B* is distilled off in order to recover the solvent used and to free the oil from the solvent. The last traces of the solvent in the oil is removed by passing steam through the oil and the mixture is allowed to stand in a separatory funnel and the water layer drawn off. The moist oil is now mixed with anhydrous sodium sulfate at ordinary temperature and the mixture resulting thereof allowed to stand for at least 48 hours in the desk. The oil is then filtered off and the oil thus obtained which is light yellow is the sample of oil used in this investigation.

PHYSICAL PROPERTIES OF THE OIL

The oil is clear and in a thin layer has a very light yellow tint, and when in a layer of moderate thickness is light yellow. It is not disagreeable to the taste nor as to odor.

The specific gravity of the oil, determined by the pycnometer, was found to be 0.9141 at 27.5°C. The index of refraction by means of the Abbe refractometer was 1.4698 at 30.9°C. The melting points are −8° to −9° and the solidifying points −9° to −10°C. These figures show that the oil at ordinary temperatures is liquid.

CHEMICAL PROPERTIES OF THE OIL

Chemical characteristics

The chemical and physical characteristics given in the following tabulation represent the averages of several determinations. These were determined for the purpose of ascertaining the general composition of the oil, as well as to furnish a basis of comparison with other oils. For purposes of direct comparison the chemical and physical constants of *Ricinus comunis* oil and *Croton tiglium* oil are here included.

	Jatropha curcas	*Ricinus comunis*[a]	*Croton tiglium*[a]
Specific gravity	0.9141	0.9591	0.9437
Refractive index	1.4698	1.4795 to 1.4803	1.4781
Solidifying point °C.	−8° to −10°	−10° to −12°	−7°
Melting point °C.	−8° to −9°		
Saponification value	195.89	176.7 to 186.6	192.9 to 215.6
Iodine number (Hanus)	101.8	81.4 to 90.6	101.7 to 109.1
Hydroxyl value	2.15		
Acetyl value	2.16	149.9 to 150.5	19.82 to 32.66[b]
Acid number	10.2		
Unsaponifiable matter	0.5		0.55[b]

[a] William H. Brown. 1921. Minor products of Philippine forests. Philippine Bureau of Forestry Bulletin. 22 (vol. 2): 1–410. *Fig. 1–157.*

[b] M. A. Rakusin. 1906. Uber das verhalten der wichtigsten planzenole gegen das polrisierte lichte. Chem. Zeit. p. 143.

It is evident that the oil of *Jatropha curcas* is not of the same type as that of castor oil but is more like that of the oil of *Croton tiglium.* The data show that it contains a very little amount of soluble or volatile fatty acids and a very little amount of hydroxylated acids, the hydroxyl value being 2.15 per cent and the saponification number 195.89 mgm It contains very little unsaponifiable matter, only 0.5 per cent.

Separation of the saturated fatty acids from the unsaturated fatty acids in the neutral oil

The resolution of the neutral oil into the saturated and unsaturated fatty acids was effected by the same principle as that of the lead-salt-ether method of Gusserow (1828) and of Varrentrapp (1903); the method followed by the writer (1924) in a previous investigation of this kind being adopted. This method involves the conversion of the acids into their lead salts, which in the case of the saturated acids are insoluble in dry ethyl ether, while those of the unsaturated acids are soluble.

A number of determinations were conducted and the trials that are close to each other are given in table 1.

TABLE 1

Showing the separation of the natural oil into solid and liquid acids

NO. OF TRIALS	WT. OF OIL USED	UNCORRECTED				CORRECTED			
		Liquid acids		Solid acids		Liquid acids		Solid acids	
		Weight	Per cent	Weight	Per cent	Weight	Per cent	Weight	Per cent
		gram		*gram*		*gram*		*gram*	
1	22.8920	19.0232	83.10	3.4896	15.24	19.2659	84.16	3.2461	14.18
2	49.2454	41.0707	83.40	7.8793	16.00	41.6173	84.51	7.3326	14.89
3	54.123	45.4632	83.99	7.6773	14.18	45.9883	84.97	7.1442	13.20
4	30.3746	25.0805	82.57	4.5259	13.9	25.3772	83.53	3.9305	12.94
Mean			83.26		14.83		84.29		13.8

As seen from table 1 the neutral oil is composed of 84.29 per cent of liquid acids and 13.80 per cent of solid acids.

The unsaturated acids

The mixture of unsaturated acids was found to have the following physical and chemical constants: (The figures in the following table represent the average of several determinations made on the liquid acids.)

Melting point	17° to 20°C.
Solidifying point	6° to 7°C.
Saponification value	192.82
Iodine number	143.5
Neutralization value	198.65
Mean molecular weight	290.94

Analysis of the unsaturated acids. The separation of the liquid acids, found in the unsaturated portion was based on the different solubility of the bromo-compounds in petroleum ether upon bromination. The different bromo-derivatives were separated according to the method of Eiber and Muggenthaler (1903). By this method, the unsaturated acids are dissolved in dry ethyl ether and the solution resulting cooled down to −10° to −12°C. and liquid bromine added very slowly. The mixture is then allowed to stand for two hours in a bath kept at ±2°C. of −10° to −12°C. The ethereal solution contained no precipitate, showing the absence of any hexabromo-derivative. It is, therefore, evident that linolenic acid is absent in the mixture, since linolenic hexabromide is insoluble in dry ethyl ether.

The ethereal solution was then repeatedly washed with 10 per cent sodium thiosulfate solution in a separatory funnel in order to remove all of the excess of bromine added. The washed layer was next dehydrated with sodium sulfate. The mixture was allowed to stand for about twenty-four hours in the desk after which the ethereal layer was filtered into a flask and the ether recovered in the usual way. The residue was then boiled

with low boiling point petroleum ether. In this connection it must be remembered that oleic dibromide is very soluble in this solvent while the bromo-compound due to linolic acid is soluble with difficulty.

The boiled solution was allowed to stand for about twenty-four hours in the ice box until crystals of tetrabromide due to linolic acid had separated out. The crystals were filtered through a tared filter paper and the filtrate concentrated to about half its volume. The filter paper containing the precipitate was dried in an electric oven to constant weight. This is reported in table 2 as the first crop of tetrabromide.

After allowing the concentrated filtrate to stand in an ice closet for about forty-eight hours a second crop of crystals was obtained. No further separation was obtained when the filtrate was concentrated further, even after allowing the concentrated mixture to stand in the closet for a period of about three days. The weight of the second crop of crystals was ascertained in the usual way and is reported in table 2 as the second crop of tetrabromide.

The remaining solvent in the mixture was completely eliminated in the usual way and the final residue weighed. The residue represents the whole of the bromo-derivative of oleic acid and a little of linolic acid since by the separation given above it is almost impossible to separate completely all of the bromo-compound due to linolic acid.

The bromine content of the crops and that of the residue was determined by the method used in a previous investigation (Soliven, 1924). The melting point of the different crop of crystals was also determined for purposes of comparison with that of pure linolic tetrabromide.

From the weight of the different crops of crystals the corresponding amount in terms of linolic acid and linolic glyceride was calculated. Also from the bromine content of the residue the proportion of oleic dibromide and linolic dibromide could also be calculated, since pure oleic dibromide contains 36.18 per cent of bromine and linolic dibromide, 53.33 per cent of bromine. The data reported in table 2 were obtained from a series of separations made.

TABLE 2a

Showing the composition of the liquid fatty acids by the bromo-derivative method

Weight of liquid acid used		49.0562 grams
Ether insoluble bromide		None
First crop of tetrabromide		36.5620 grams
Melting point	114°C.	
Bromine content	53.5 per cent	
Second crop of tetrabromide		6.4548 grams
Melting point	113.6°C.	
Bromine content	52.7 per cent	
Residue (mixture of dibromide and tetrabromide)		47.0230 grams
Bromine content	46.00 per cent	
Dibromide in residue	30.1258 grams	
Tetrabromide in residue	16.8972 grams	

Total tetrabromide found		59.9140 grams
Total dibromide found		30.1258 grams
Linolic acid found		27.4951 grams
Oleic acid found		19.2203 grams
Percentages of the constituents found:		
Oleic acid	39.18	
Linolic acid	56.04	
Oleic glyceride	40.94	
Linolic glyceride	58.56	

TABLE 2b

Showing the composition of the liquid fatty acids by the bromo-derivative method

Weight of liquid acid used		64.8672 grams
Ether insoluble bromide		None
First crop of tetrabromide		14.3782 grams
Bromine content	53.1 per cent	
Melting point	113.2°C.	
Second crop of tetrabromide		9.6182 grams
Melting point	114°C.	
Bromine content	53.4 per cent	
Residue (dibromide and tetrabromide)		94.0725 grams
Bromine content	45.9 per cent	
Dibromide in residue	40.7616 grams	
Tetrabromide in residue	53.3109 grams	
Total tetrabromide found		77.3073 grams
Total dibromide found		40.7616 grams
Linolic acid found		36.1086 grams
Oleic acid found		26.0059 grams
Percentages of the constituents found:		
Oleic acid	40.01	
Linolic acid	55.66	
Oleic glyceride	41.81	
Linolic glyceride	58.16	

TABLE 2c

Showing the composition of the liquid fatty acids by the bromo-derivative method

Weight of liquid acid used		59.6708 grams
Ether insoluble bromide		None
First crop of tetrabromide		13.0781 grams
Melting point	112.9°—113°C.	
Bromine content	53.6 per cent	
Second crop of tetrabromide		2.2182 grams
Melting point	114°C.	
Bromine content	53.9 per cent	
Residue (dibromide and tetrabromide)		94.1678 grams
Bromine content	46.48 per cent	
Dibromide in residue	37.6200 grams	
Tetrabromide in residue	56.5478 grams	
Total tetrabromide found		71.8441 grams
Total dibromide found		37.6200 grams
Linolic acid found		33.9962 grams
Oleic acid found		24.0016 grams
Percentages of the constituents found:		
Oleic acid	40.20	
Linolic acid	56.10	
Oleic glyceride	42.01	
Linolic glyceride	58.62	

It may be seen in table 2 that the saturated acids are composed of 39.8 per cent oleic acid and 56.2 per cent linolic acid or 41.5 per cent oleic glyceride and 58.4 per cent linolic glyceride.

The neutral oil contains on the average 84.29 per cent unsaturated acids and 13.8 per cent of solid fatty acids. Translating the analysis of the unsaturated acids into the basis of the neutral oil, data in table 3 are obtained.

TABLE 3

Résumé of table 2. Showing the composition of liquid fatty acids

ACIDS	FOUND	CALCULATED TO THE BASIS OF 100	ACIDS IN ORIGINAL OIL	GLYCERIDES IN ORIGINAL OIL
	per cent	*per cent*	*per cent*	*per cent*
Oleic	41.50	41.54	35.21	36.79
Linolic	58.40	58.46	49.28	50.50
Total	99.90	100.00	84.49	87.29

It may be seen from table 3 that the neutral oil contains on the average 36.79 per cent oleic glyceride and 50.50 per cent of linolic glyceride, making a total of 87.29 per cent, the balance from 100 being due to the glycerides of solid acids.

The saturated acids

The physical and chemical constants of the saturated acids are given in the following tabulation:

Melting point	44° to 45°C.
Solidifying point	46° to 47°C.
Saponification value	292.6
Iodine number	9.96

The analyses of the saturated fatty acids were not conducted as there are no proper facilities for this work in the laboratory. It will be done as soon as these facilities are provided.

THE COMPOSITION OF THE SEED KERNEL AND PULP

Following the method of analysis used in a previous investigation by the writer (1924) along the same line, the figures reported in table 4 were obtained.

TABLE 4

Showing the composition of the freshly peeled kernels and fruit pulp

CONSTITUENTS	KERNELS	PULP
	per cent	*per cent*
Shell (by difference)	42.88	
Kernels	58.12	
Moisture	6.80	65.10
Ash	4.82	9.03
Ether extract	51.89	
Protein (Nitrogen×6.25)	23.35	2.81
Crude fiber	3.39	
Nitrogen free extract (by difference)	10.71	

As mentioned elsewhere in this paper the seed is very rich in oil. It is equally rich in protein, there being 23.35 per cent, based on the original sample. The seed contains a small amount of water and a fair amount of crude fiber. In this connection it should be mentioned that the seeds used were all air-dried sample. The seed also contains a fair amount of ash and nitrogen-free extract. Provided that the purgative properties of the nut are carried away with the oil during its extraction, the value of the cake as an animal feed is evident. Moreover, even if purgative properties are in the cake after the extraction of the oil, it would be suitable for feeding purposes if means of separating these properties could be devised. The pulp is very poor in protein, hence could not be utilized as feed. It contains, however, a fairly high percentage of ash, there being 9.03 per cent, based on the original sample. The green pulp contains latex which is in itself bitter. The composition of the bitter principle has been reported to be due to a substance of unknown composition (Anonymous, 1919). If, however, during the course of the ripening of the fruit the bitter principle of the pulp does not undergo any chemical change it could not be used. The isolation of the bitter principle of the pulp, or the purgative principle of the cake and oil has not been attempted.

The ash from the kernel was found to be richer than the ash from the pulp in those constituents analyzed, except in the oxide of potassium and sodium. From data in the table it is evident that the pulp can be used more advantageously as a source of fertilizer than as a source of an animal feed.

TABLE 5

Showing the composition of the ash from the kernels and pulp of the fruit

CONSTITUENTS	KERNEL	PULP
	per cent	*per cent*
Insoluble matter and silica	1.02	3.34
Calcium oxide	21.03	5.42
Phosphoric acid anhydride	6.03	3.12
Aluminum oxide	0.16	0.66
Ferric oxide	1.04	0.40
Potassium oxide	17.88	36.91
Sodium oxide	16.59	23.54
Magnesium oxide	9.42	6.00
Sulfur trioxide	9.75	1.32

CONCLUSIONS

1. The seed of *Jatropha curcas* is composed of 58.12 per cent kernel and 42.88 per cent shell.

2. The kernels contain 51.89 per cent yellowish oil or 22.23 per cent on the basis of the whole seed.

3. The kernel was found to have the following composition:

Moisture	6.80 per cent
Ash	4.82 per cent
Ether extract	51.89 per cent
Protein	23.35 per cent
Crude fiber	3.39 per cent
Nitrogen free-extract (obtained by difference)	10.71 per cent

It would seem that the cake derived from the extraction of the oil may be utilized as feed for animals if the bitter principle is removed. To prove this, feed experiments are necessary.

4. The ash from the kernel was found to have the following composition:

Insoluble matter and silica	1.02 per cent
Calcium oxide	21.03 per cent
Phosphoric acid anhydride	6.03 per cent
Aluminum oxide	0.16 per cent
Ferric oxide	1.04 per cent
Potassium oxide	17.88 per cent
Sodium oxide	16.59 per cent
Magnesium oxide	9.42 per cent
Sulfur trioxide	9.75 per cent

The cake resulting from the extraction of the oil may be found to have value as a source of fertilizer, if properly treated.

5. The pulp can not be used as feed but it may be utilized advantageously as a source of fertilizer, as shown from the following composition of the ash from the pulp. (The pulp contains 9.03 per cent of ash.)

Insoluble matter and silica	3.34 per cent
Calcium oxide	5.42 per cent
Phosphoric acid anhydride	3.12 per cent
Aluminum oxide	0.66 per cent
Ferric oxide	0.40 per cent
Potassium oxide	36.91 per cent
Sodium oxide	23.54 per cent
Magnesium oxide	6.00 per cent
Sulfur trioxide	1.32 per cent

6. The oil is composed of 84.29 per cent of unsaturated fatty acids and 13.80 per cent of saturated fatty acids.

7. The liquid, or unsaturated acids, is composed of 36.79 per cent of olein and 50.50 per cent of linolein expressed on the basis of the neutral oil.

8. Since the glyceride of linolic acid predominates in the neutral oil, it may be considered a semi-drying oil.

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GROWTH AND DEVELOPMENT OF YOUNG RICE PLANTS AS INFLUENCED BY THE FOOD IN THE SEED[1]

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WITH TWO TEXT FIGURES

INTRODUCTION

The functions of the parts of a rice seed are known. That the endosperm is the store of food for use by the developing young plant has been long known. But, so far as available literature on germination shows, the amount of sustenance the young rice plant derives from this reserved food, has not yet been ascertained.

During the last three or four years, while trying to study the salt requirements of the young rice plants, our attention has been drawn to the fact that greening of the leaves of this plant becomes evident very soon after sprouting. Usually, it requires only about two days after sprouting (initial germination) for the shoot to become green enough to be able apparently to synthetize its own carbohydrate food. Two questions, therefore, may be asked: (*a*) If at this stage of the life of the young rice plants, the grain should be detached, for one reason or another, from the developing embryo, can it continue to grow and attain a normal development? (*b*) How much of the early growth and development of the young rice plant is due exclusively to the food stored in its seed?

This brief study was conducted in the Laboratory of Plant Physiology at the College of Agriculture, Los Baños, from the latter part of June to the end of August, 1927. The cultures were carried out largely by an assistant, Mr. Emilio Macasaet.

MATERIALS, METHODS, AND RESULTS

The plant

The young rice plants were of a lowland variety. The seeds were germinated and seedlings set up in cork stoppers in a manner similar to that described by Espino (1920)[2]. The seedlings were supplied with the culture solutions. The grains were removed from some seedlings three days after sprouting, when the shoots were about three centimeters long. At this time the shoots were somewhat green.

[1] Experiment Station contribution No. 516. Received for publication, January 5, 1928.

[2] Espino, Rafael B. 1920. Some aspects of the salt requirements of young rice plants. Philippine Journal of Science **16:** 455–525.

The culture solutions

Fifteen different complete culture solutions (each in duplicate) of Espino's 4-salt type A formed one set of cultures. All these culture media were found by Espino (1920) to be able to grow young rice plants satisfactorily. Hence, they were selected for use in this study. They were prepared as described in the 1920 study; each contained monopotassium phosphate, calcium nitrate, ammonium sulfate and magnesium sulfate. The usual trace of iron was added to each culture solution as iron phosphate.

Each set of cultures was run in duplicate. One set had seedlings with the seeds intact. The other set had seedlings without seeds. The seeds were removed at the time of starting the experiments. These two sets formed what are here designated as *first trial* and *second trial.*

Fig. 1.—Cultures in which the seeds were left intact.

The *first trial* was run from June 22 to July 21, 1927, and the *second trial,* from August 1 to 31, 1927. Each culture solution was changed every two days.

Precautions taken

The seeds were removed carefully, so as not to cause any unnecessary injury to the seedling. The wound or scar left after the removal of the seed was not allowed to touch the culture solution. This precaution prevented infection which is apt to set in in a case of this kind. Care was also taken to prevent the seeds (in the case of the seedlings with seeds) touching the solution, as the young plant draws the food directly from the seed and not after the food has passed out into the culture solution.

Criteria of results

The results are expressed under the following criteria:

External appearance of plants. From time to time the general appearance of the plants in the cultures was observed. The height of the shoots, the length of the roots, and the number and color of leaves were

noted. It was observed that, as a whole, the plants in the seedless cultures were of a slightly paler green and were shorter than those with the seeds on. There was not any constant difference in number of leaves and in the length of roots in the cultures from the two sets.

At the time of harvest, the cultures in the second trial were photographed, (see fig. 1 and 2).

Dry weights of tops. At the time of harvest, the top was severed from the root in each culture. The tops from the different cultures were separately dried and their respective weights determined. The data obtained are recorded in table 1. Under set I in this table, are the data from the cultures where the seeds were not detached. The difference between the dry weight of tops from a culture *with* seeds and that from a corresponding culture *without* seeds was determined. This difference is expressed (see table 1) in term of percentage.

Dry weights of roots. The roots from the different cultures were dried and their dry weights separately determined. The data thus obtained are recorded in table 1.

Dry weights of tops and roots. The dry weights of tops and of roots from each culture were added. This method was followed in the cultures *with* seeds as well as those *without* seeds. A comparison of the data obtained from the two similar cultures was made and the difference is expressed in percentage in table 1.

DISCUSSION OF RESULTS

The results from this rather limited study are here briefly discussed under the twofold objects named in first part of this paper.

Can the young rice plant continue to grow if the seed is removed soon after germinating? The fact that in all the cultures from which the seeds were removed not a single plant died shows beyond question that young rice plants three days old after germination can continue to grow even in the complete absence of the food which the young plants obtain from the seed. There was, however, a marked setback in growth, especially during the very early development of the young rice plants. But later, the *seedless* cultures picked up in growth fast enough to be able to produce plants that were quite well developed, (see fig. 2).

How much of the early growth and development of the young rice plant is due exclusively to the food stored in its seed? Examination of the data in table 1 shows that in term of the criteria of results here employed, invariably the plants *with seeds* were better developed than those *without seeds.* In the two trials, the average difference of the yield of tops from the fifteen cultures *with seeds* and the same number of cultures *without seeds* was 53 per cent. Under yield of roots, the average difference between the fifteen cultures *with seeds* and the fifteen cultures *without seeds* was 53 per cent in

first trial and 47 per cent in the second trial. In the two trials, the average difference between the tops and roots from set I and the tops and roots from set II was 53 per cent. It is, therefore, very apparent that an average of 53 per cent of the early growth and development of the young rice plants was due to the food which was absorbed from the seeds.

Fig. 2.—Cultures in which the seeds were removed from the seedlings.

SUMMARY OF CONCLUSIONS

1. Removal of the seeds, thus depriving the young rice plants of food for early development, materially retarded the vegetative development, but did not cause the death of the young plants. At the end of thirty days the *seedless* cultures appeared quite well developed.

2. An average of about 53 per cent of the early growth and development of the young rice plants was supported by the food which was absorbed from the seed.

TABLE 1

Dry weights of tops and of roots of young rice plants, with and without seeds, grown in complete culture solutions for thirty days

CULTURE NO.	FIRST TRIAL June 22 to July 21, 1927									SECOND TRIAL August 1 to August 31, 1927								
	Tops			Roots			Tops and roots			Tops			Roots			Tops and roots		
	Set I	Set II	Difference	Set I	Set II	Difference	Set I	Set II	Difference	Set I	Set II	Difference	Set I	Set II	Difference	Set I	Set II	Difference
	gram	*gram*	*per cent*	*gram*	*gram*	*per cent*	*gram*	*gram*	*per cent*	*gram*	*gram*	*per cent*	*gram*	*gram*	*per cent*	*gram*	*gram*	*per cent*
1	.320	.195	39	.075	.046	39	.395	.241	39	.339	.202	40	.045	.032	29	.384	.234	39
2	.290	.166	43	.066	.034	48	.356	.200	44	.300	.169	44	.046	.027	41	.346	.196	43
3	.275	.132	57	.067	.026	61	.342	.158	54	.266	.149	44	.065	.027	58	.331	.176	47
4	.342	.114	67	.066	.022	67	.408	.138	66	.349	.115	67	.036	.022	37	.385	.137	64
5	.282	.186	34	.054	.036	33	.336	.222	34	.285	.179	37	.062	.025	60	.377	.204	43
6	.288	.150	48	.071	.036	49	.359	.186	48	.296	.135	55	.065	.027	58	.361	.162	55
7	.256	.155	39	.054	.012	78	.310	.167	46	.272	.141	48	.051	.028	45	.323	.169	48
8	.335	.135	59	.075	.017	77	.410	.152	63	.347	.147	58	.050	.024	52	.397	.171	57
9	.350	.138	61	.066	.028	58	.416	.166	62	.343	.160	53	.021	.018	14	.364	.178	51
10	.284	.147	48	.064	.035	45	.348	.182	48	.292	.136	53	.037	.025	32	.329	.161	51
11	.284	.126	56	.050	.024	52	.334	.150	55	.278	.114	59	.059	.026	56	.337	.140	58
12	.353	.143	60	.052	.032	38	.405	.176	57	.333	.168	50	.052	.022	58	.385	.190	51
13	.295	.144	51	.061	.030	51	.356	.174	51	.304	.139	64	.042	.023	45	.376	.162	57
14	.372	.109	71	.050	.021	58	.422	.130	69	.309	.118	62	.069	.020	71	.378	.138	63
15	.378	.130	66	.054	.036	33	.432	.166	62	.377	.149	60	.040	.025	47	.417	.174	58
Average of 15 cultures..			53			53			53			53			47			53

AMERICAN AND FOREIGN CAPITAL ACQUISITIONS OF THE PHILIPPINE PUBLIC DOMAIN[1]

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Of the Department of Rural Economics

WITH TWO CHARTS AND ONE MAP

The Philippine Government is trustee of a vast public domain, over 12,000,000 hectares[2] of which are still alienable for agricultural purposes. The development of these extensive areas requires large investments of capital. The Philippine Islands being a young country finds its capital resources inadequate to speedily carry on development of so great a magnitude. Countries the world over have witnessed in the early stages of their development the influx of foreign capital and have had to grapple with problems which this capital necessarily entails. In the Philippines during the past quarter of a century, American and foreign capital has been persistently knocking for entrance at her doors, eager and ready to exploit on a large scale the large undeveloped public domain. But the mere mention of foreign capital stirs vehement opposition and antagonism in our conservative and cautious government and among our people. Consequently, up to the present, agriculture remains the one basic industry almost wholly capitalized by domestic capital. Under strict limitations, however, we find today considerable American and foreign capital invested in agricultural enterprises of the country. Substantial areas have been acquired by American and foreign corporations from the public domain. There has been no attempt so far to determine the extent of these holdings, and no study has been made of their relations to the public land policy of the Philippine government. This paper aims to accomplish both.

THE PUBLIC LAND POLICY OF THE PHILIPPINE GOVERNMENT

The enunciation of a public land policy in the administration of the public domain of the country, was embodied in the Act of Congress of July 1, 1902, providing for the administration of the government of the Islands. Congress laid down the fundamental policy that the public domain of the Philippine Islands is to be held in trust by the State primarily for the inhabitants of the country, for disposal in small areas so as to benefit the greatest number. Congress zealously guarded the interests of the people of the

[1] Experiment Station contribution No. 517. Received for publication, November 23, 1927.

[2] Bureau of Forestry estimate.

Islands against any partition of the public domain into large estates. Section 15, Act of Congress, July 1, 1902, reads:

> That the Government of the Philippine Islands is hereby authorized and empowered, on such terms as it may prescribe, by general legislation, to provide for the granting or sale and conveyance to actual occupants and settlers and other citizens of said islands such parts and portions of the public domain, other than timber and mineral lands of the United States, in said islands as it may deem wise, not exceeding sixteen hectares to any one person, and for the sale and conveyance of not more than one thousand and twenty-four hectares to any corporation or association of persons.

There was a well-founded fear on the part of Congress when it considered Philippine legislation in 1902, that should no effective checks be made to regulate the acquisition of the public domain of the Philippine Islands, powerful corporations would parcel it out in large blocks. That this limitation on area did not meet with favor among those interests in the United States that saw opportunities for large agricultural investments, was amply shown in the hearings of the Philippine bill before Congress in 1902, when efforts were exerted by private parties to influence the views of its members for a more liberal land policy. As finally adopted, the public land policy laid down in the Act of Congress of July 1, 1902, left very little power to the discretion of the government of the Philippine Islands. The insertion of provisions giving authority to the Philippine government for the purchase of the extensive holdings of religious corporations in the Islands, affords more light on the views of Congress in defining a public land policy for the Philippine Islands. This purchase was considered urgent in view of serious agrarian problems arising from the ownership of large estates by religious corporations. Congress authorized in the Act of July 1, 1902, the purchase of about 160,000 hectares of agricultural lands from various religious orders in the Philippine Islands, and laid down the principle of selling these lands, known as the Friar Estates, on liberal terms, preferably to tenants on the estates. In the discussions before Congress during the hearings of the Philippine bill, there was much divergence of opinion among its members as to the policy to be pursued in the disposition of the Friar Estates, once the purchase was effected. The inevitable question of area which individuals or corporations may acquire from these estates came up for discussion. The fear of exploitation by American capital and the welfare of Filipino tenants on the estates were dominant in the minds of many members of Congress. The view which ultimately prevailed and was embodied in the Act was that the Friar Estates are separate and distinct from public lands and the Philippine government was given the power to determine the manner of their disposition and the areas which may be sold to one individual or corporation.

Machinery to carry into effect the public land policy as defined by the Act of Congress of July 1, 1902, was immediately provided for in the passage on October 7, 1903, by the Philippine Commission of Act 926, entitled

"The Public Land Act," which provided among other things for the manner of selling and leasing of portions of the public domain of the Philippine Islands. On April 26, 1904, after the purchase of the Friar Estates was consummated, the Philippine Commission passed Act 1120 providing for the sale of the estates to Filipino tenants on the land and to others. These laws strengthened the cardinal principle laid down in the act of Congress that the public domain of the Philippine Islands is to be held in trust by the State for disposal in small parcels, primarily for the benefit of inhabitants of the Islands.

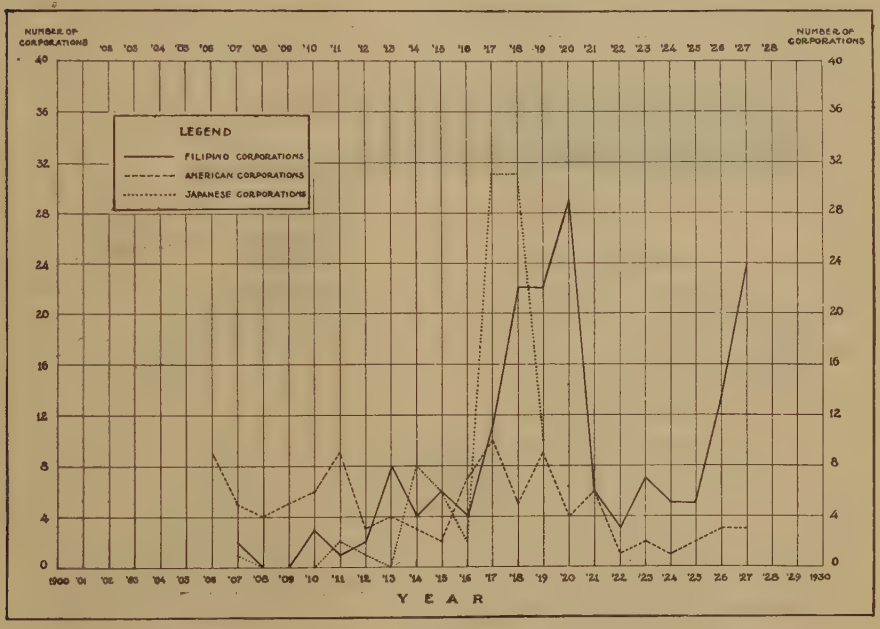

Chart 1.—Showing the number of registrations of agricultural corporations by nationalities and by years.

SALES AND LEASES OF AGRICULTURAL PUBLIC LANDS TO CORPORATIONS

Under the provisions of the Public Land Act of 1903,

any corporation or like association of persons organized under the laws of the Philippine Islands or of the United States, or any State, Territory or insular possession thereof, and authorized to transact business in the Philippine Islands, may purchase a portion of the public domain not to exceed one thousand and twenty-four hectares.

Any corporation of the same character may lease a portion of the public domain not to exceed one thousand and twenty-four hectares for a period of twenty-five years; this lease may be renewed for a like period upon its expiration. The minimum price for sales is fixed by law at ten pesos a hectare and the minimum rate for lease, at fifty centavos per hectare annually. Under the law, all corporations organized in the Philippine

Islands or foreign corporations authorized to transact business in the country may purchase or lease public lands for agricultural purposes within this limitation.

Organization of agricultural corporations

The rigid limitations of the land law proved no bar to the organization of agricultural corporations. Not long after its passage, American as well as foreign corporations began to be organized for purposes of agricultural exploitation.

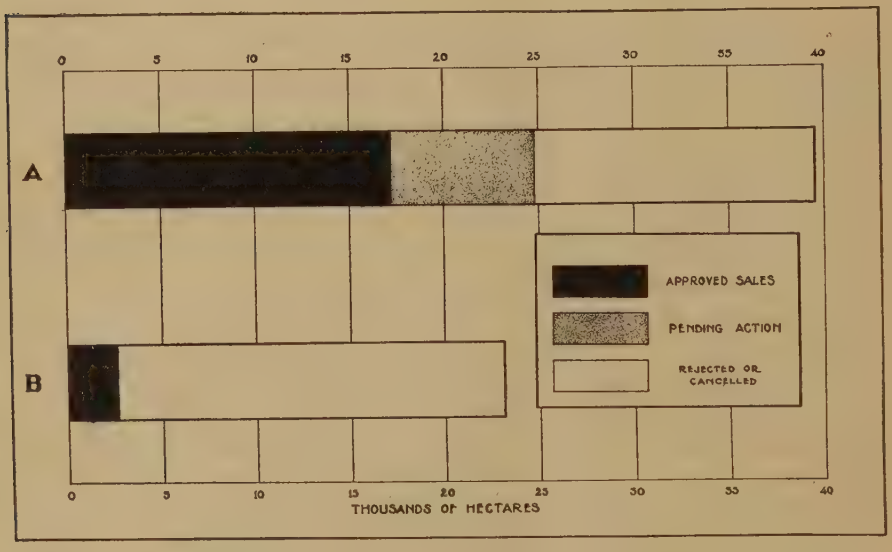

Chart 2.—*A*—Showing 39,603.7 hectares of agricultural public land covered by sales applications by American corporations and action taken on them by the Bureau of Lands. *B*.—Showing 23,232.5 hectares of agricultural public land covered by sales applications by foreign corporations and action taken on them by the Bureau of Lands.

Chart 1 shows the number of registrations of agricultural corporations by nationalities and by years. A total of three hundred and eighty-five agricultural corporations has been registered with the Bureau of Commerce and Industry up to September 30, 1927. Of these, one hundred and seventy-seven are capitalized by Filipinos, one hundred and three by Americans, ninety-three by Japanese, and twelve by other foreigners. Reference to chart 1 will show a fair activity in the organization of American corporations from 1906 to 1919, and a marked decline later. There is shown a remarkable activity in the organization of Japanese corporations from 1917 to 1918, and a complete cessation after 1919. Filipino corporations have shown a marked increase in recent years. There has been a lack of interest by American corporations of large capital to invest in agricultural enterprises in the Islands under the limitations of the land law. The Japanese, however, have shown a keen interest to enter this field.

American and foreign acquisitions of the public domain

A large number of American and foreign corporations organized for agricultural purposes never attempted to purchase or lease portions of the public domain. Furthermore, a large proportion of those which filed sale and lease applications with the Bureau of Lands have failed, for various reasons, to obtain possession of the areas applied for.

Chart 2 shows that of 39,603.7 hectares of agricultural public land covered by sales applications by American corporations, only 17,155.4 hectares have been approved and sold; that 7,611 hectares are still pending action by the Bureau of Lands; and that 14,837.3 hectares have been rejected or cancelled. The chart also shows that of 23,232.5 hectares covered by sales applications by foreign corporations, only 2,647.7 hectares have been approved, and that the remainder has been cancelled or rejected. These figures show that a large proportion of sales applications by American corporations has been rejected or cancelled, and that an unduly large proportion by foreign corporations has met with similar fate.

TABLE 1

Showing sales of the public domain to American corporations

DATE	NAME OF CORPORATION	CAPITAL	LOCATION OF LAND	AREA SOLD
		pesos		*hectares*
1906	Assinga Co.	30,000	Cagayan	907
1910	Basilan Plantation Co.	500,000	Basilan	886
1910	Río Grande Rubber Estate	400,000	Cotabato	1,023
1911	Baco Rubber Development Co.	40,000	Mindoro	200
1913	Mercedes Plantation Co.	20,000	Zamboanga	72
1913	The Piso Coconut and Cattle Ranch	175,000	Davao	1,023.7
1913	Talomo Plantation	10,000	Davao	367
1914	Yakan Plantation Co.	50,000	Basilan	450
1914	Kolambugan Lumber and Development Co	150,000	Lanao	37
1914	Kumassi Plantation Co.	60,000	Davao	802
1915	Riverside Plantation and Co.	50,000	Davao	560
1915	The Kulaman Co.	60,000	Davao	467
1915	Progressive Stock Raisers' Association	12,000	Zamboanga	1,024
1916	Pindisaan Plantation Co.	40,000	Davao	654
1917	The Lais Trading and Development Co.	[a]	Davao	617
1917	Baras Plantation Co.	100,000	Lanao	584.7
1917	Tarlac Plantation Co., Inc.	[a]	Cotabato	952
1917	The Moro Improvement and Trading Co.	50,000	Davao	1,021
1918	Mount Apo Plantation Co.	100,000	Davao	348
1918	The Lacaron Plantation Co.	30,000	Davao	694
1919	The Buenavista Plantation Co.	150,000	Zamboanga	512.8
1919	Moro Plantation Co.	[a]	Davao	783.9
1919	Basilan Lumber Co.	750,000	Basilan	10
1919	American Rubber Co.	600,000	Basilan	922.9
1919	Sumagui Development Co.	40,300	Mindoro	600
1922	Mangal Development Co.	25,000	Zamboanga	17.8
1923	The Malabang Plantation Co.	50,000	Lanao	255
1925	Christensen Plantation Co.	100,000	Davao	963.6
1925	Van Plantation Co.	100,000	Davao	400
		3,692,300		17,155.4

[a] Data not available.

TABLE 2

Showing sales of the public domain to foreign corporations

DATE	NAME OF CORPORATION	NATIONALITY	CAPITAL	LOCATION OF LAND	AREA SOLD
			pesos		*hectares*
1907	La Yebana	German	[a]	Isabela	168
1912	Basilan Development Co.	Japanese	30,000	Basilan	457
1914	The Ohta Development Co.	Japanese	500,000	Davao	1,015
1917	Mintal Plantation Co.	Japanese	50,000	Davao	1,007.7
			580,000		2,647.7

[a] Data not available.

TABLE 3

Showing leases of the public domain by American corporations

DATE	NAME OF CORPORATION	CAPITAL	LOCATION OF LAND	AREA LEASED
		pesos		*hectares*
1910	The Sulu Development Co.	20,000	Siasi	1,005
1913	Locanin Plantation Co.	20,000	Bataan	393.1
1913	The Mindanao Estate Co.	[a]	Davao	828.4
1916	Agusan Coconut Co.	[a]	Bukidnon	1,013.3
1916	Gohn and Haley, Inc.	9,000	Davao	763
1916	Phal and Hendron, Inc.	12,000	Davao	128.2
1916	The Mindoro Sugar Co.	6,000,000	Mindoro	36.8
1917	Gulf Plantation Co.	100,000	Davao	534.3
1917	Bukidnon Cattle and Coffee Co.	[a]	Bukidnon	1,024
1917	Gohn and Haley, Inc.		Davao	81.3
1918	Balabagan Coconut Estate	80,000	Lanao	604
1919	Vega Chica Agricultural Co.	[a]	Nueva Ecija	224.5
1921	Puncan Plantation Co.	10,000	Nueva Ecija	877.9
1922	Celebes Plantation Co.	100,000	Cotabato	1,017.2
1926	Mangal Development Co.	25,000	Zamboanga	511.4
		6,376,000		9,042.4

[a] Data not available.

TABLE 4

Showing leases of the public domain by foreign corporations

DATE	NAME OF CORPORATION	NATIONALITY	CAPITAL	LOCATION OF LAND	AREA LEASED
			pesos		*hectares*
1915	Mindanao Agricultural and Commercial Co.	Japanese	30,000	Davao	208
1915	South Mindanao Development Co.	Japanese	20,000	Davao	763.3
1915	The Cataluñan Agricultural Co.	Japanese	20,000	Davao	120.7
1916	Lahi River Plantation Co.	Japanese	100,000	Davao	166.4
1916	Iharra Development Co.	Japanese	50,000	Laguna	65.3
1916	Riverside Plantation Co.	Japanese	50,000	Davao	267.2
1916	Bunauan Plantation Co.	Japanese	20,000	Davao	365.5
1916	Mindanao Lumber Co.	Chinese	300,000	Zamboanga	679.7
1917	Cong Lee Colambo Plantation	Chinese	20,000	Davao	187.9
1918	South Mindanao Agricultural Co.	Japanese	49,000	Davao	200.1
1920	Lamitan Plantation Co.	Japanese	25,000	Zamboanga	764.4
1920	Southern Davao Development Co.	Japanese	100,000	Davao	1,017.3
1921	Matsuoka Development Co.	Japanese	40,000	Davao	997.3
1921	Tagurano River Plantation Co.	Japanese	45,000	Davao	471.8
1921	The Guianga Plantation Co.	Japanese	25,000	Davao	323.7
1921	Tagum Plantation Co.	Japanese	50,000	Davao	678.4
1921	Lasang Plantation Co.	Japanese	20,000	Davao	761.5
1921	Mindanao Reclamation Co.	Japanese	50,000	Davao	400.9
1921	Takagi Farming Co.	Japanese	50,000	Davao	93.3
1921	Talomo River Agricultural Co.	Japanese	50,000	Davao	811.7
1921	Sirawan Plantation Co.	Japanese	20,000	Davao	148.6
1921	The Tween River Plantation Co.	Japanese	50,000	Davao	320.8
1921	North Talomo Plantation Co.	Japanese	30,000	Davao	113.3
1921	Biao Plantation Co.	Japanese	10,000	Davao	418.4
1921	Bato Plantation Co.	Japanese	20,000	Davao	927.8
1921	The Bayabas Plantation Co.	Japanese	10,000	Davao	785.7
1921	Takuman Plantation Co.	Japanese	20,000	Davao	330.4
1921	Akamino Bros.' Plantation Co.	Japanese	50,000	Davao	219
1921	Panavo Plantation Co.	Japanese	20,000	Davao	411
1921	The Ban Yek Siea Plantation and Cattle Ranch Co.	Chinese	50,000	Davao	451.9
1921	Doman Plantation Co.	Japanese	30,000	Davao	518.8
1922	Zamboanga Development Co.	Japanese	50,000	Zamboanga	352.1
1922	The Nanyo Plantation Co.	Japanese	50,000	Davao	849.5
			1,524,000		15,191.7

Table 1 shows that twenty-nine American corporations with a total capitalization of ₱3,692,300 have purchased 17,155.4 hectares of the agricultural public domain. Table 2 shows that four foreign corporations with a combined capital of ₱580,000 have purchased 2,647.7 hectares. Table 3 shows that fourteen American corporations with a total capitalization of ₱6,376,000 have leased 9,042.4 hectares. Table 4 shows that thirty-three foreign corporations with a combined capital of ₱1,524,000 have leased

15,191.7 hectares. These tables show significant facts. The total holdings of American corporations amount to 26,197.8 hectares, and the total for foreign corporations, 17,839.4 hectares, or a combined total for American and foreign corporations of 44,037.2 hectares. These figures show that the total outside capital holdings in agricultural public lands is not very extensive. Most of the areas were sold to American corporations, while most of the leases have been granted to foreign corporations. It is interesting to note that the foreign corporations which have taken agricultural public lands are almost exclusively Japanese. It is evident from these figures that outside capital investments in agricultural public lands are not large, and these small holdings are attributed to the very rigid limitations set by Congress and carried out by the Public Land Act of October 7, 1903, of the Philippine Commission. It must be borne in mind that these figures do not include the considerable areas of leases and sales granted to individual American citizens; the mineral and timber land concessions; insignificant areas acquired by partnerships; and the holdings of Spanish interests acquired through large royal grants prior to the American administration.

The map shows the geographical distribution of areas sold and leased to American and foreign corporations. The undeveloped regions of Mindanao offer great attractions to outside capital. Most of the corporation holdings are in Davao, Zamboanga, Cotabato, and Basilan. Out of the combined holdings of 44,037.2 hectares by American and foreign corporations in the whole Philippine Islands, 26,389.3 hectares are in Davao. The map further shows the major holdings of American corporations in the Friar Estates amounting to 22,484.5 hectares are found in Mindoro and Luzon.

American acquisitions of the Friar Estates

The disposal of the Friar Estates to American corporations was the subject of much criticism and investigation by Congress in 1910. Soon after the passage of Act 1120 on April 26, 1904, prescribing the manner of selling these estates, a large portion of the 160,000 hectares purchased from religious corporations was sold to Filipino tenants on liberal terms. But difficulty was experienced in disposing of the vacant and undeveloped estates in small parcels. It was believed that sales could be made if large tracts were offered to parties who had the capital to develop them on a large scale. Hence between 1908 and 1914, negotiations were made when opportunities arose for leasing or selling large areas of the Friar Estates to Americans who saw opportunities for extensive agricultural development. A progressive lease of the Tala Estate to an American citizen holding a responsible office in the Philippine government was made in April 20, 1908; this estate was subsequently purchased by the lessee. The Isabela Estate consisting of 19,448 hectares was leased to Americans in January, 1910. The Mindoro Estate, comprising 18,284.8 hectares, was sold to Americans in January, 1910. And subsequently portions of the Calamba Estate passed into American hands. Table 5 shows the major holdings of American corporations of the Friar Estates at present.

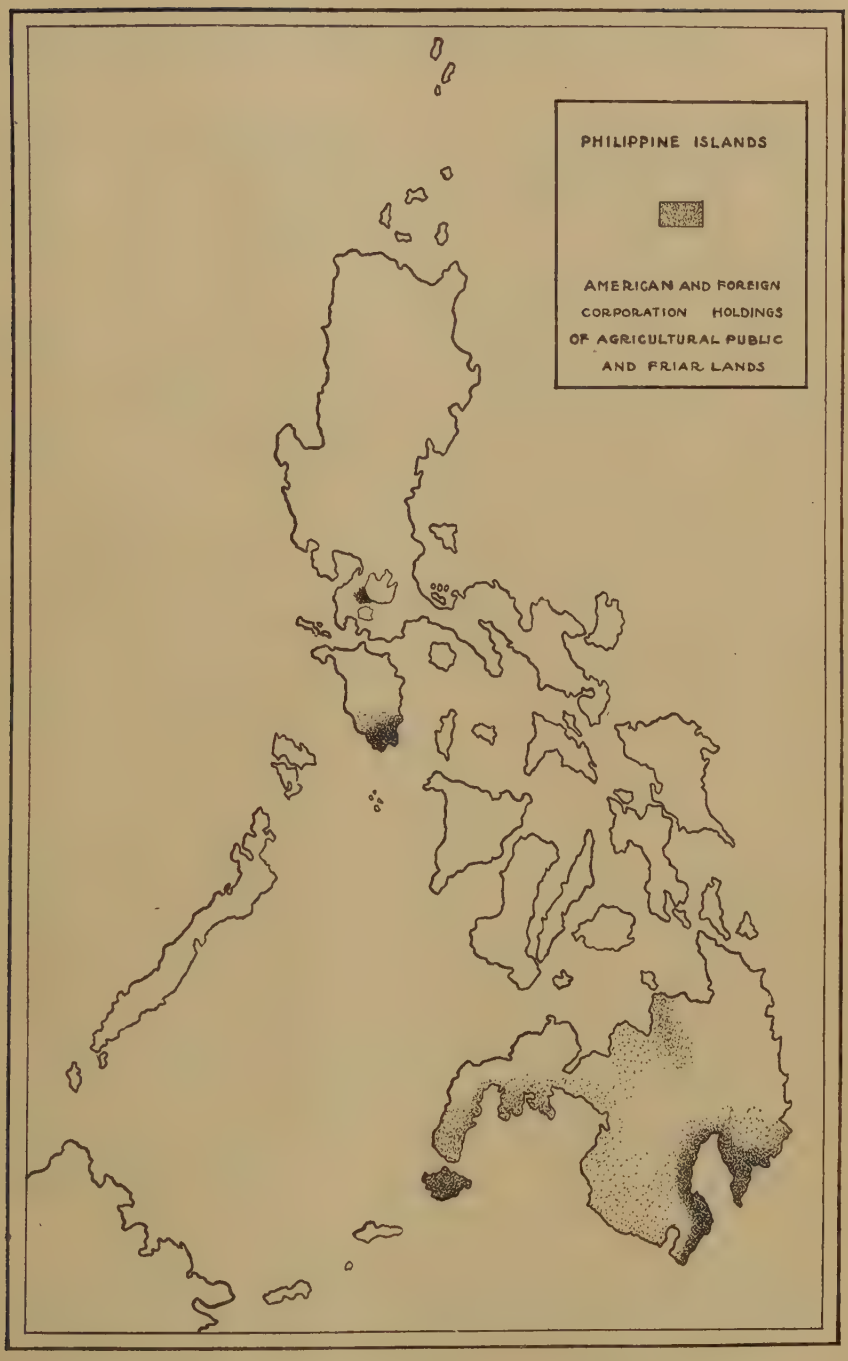
PHILIPPINE ISLANDS
AMERICAN AND FOREIGN CORPORATION HOLDINGS OF AGRICULTURAL PUBLIC AND FRIAR LANDS

TABLE 5

Showing major holdings of American corporations in the Friar estates

DATE	NAME OF CORPORATION	CAPITAL	ESTATE	AREA SOLD
		pesos		*hectares*
1910	Mindoro Sugar Co.	6,000,000	Mindoro	18,284.8
1914	Calamba Sugar Estate	[a]	Calamba	3,288.7
1926	Raymond Kapok Corporation [b]	300,000	Tala	911.0
		6,300,000		22,484.5

[a] Data not available.

[b] Purchased from the Carpenter holdings of the Tala Estate.

These sales and leases caused much bitter criticism in Congress during the years from 1910 to 1912 when the cry was vehemently made that the resources of the Philippine Islands were being turned over to the Sugar Trust. There was wholesale condemnation of the motives of Philippine officials who negotiated the sale of very large tracts of the Estates to American interests. An investigation of Philippine officials was made by the Insular Affairs Committee of the House of Representatives, and although the findings cleared the officials of guilt, Congressional opinion, as well as public sentiment in the Philippines, was decidedly against any further sale of the remaining estates in large parcels. The Secretary of War subsequently directed that thereafter the Friar Estates should be sold "subject to the limitations of the Public Land Act". The Philippine Legislature in 1914 stamped approval of this view by passing an act limiting sales of the Friar Estates in areas similar to dispositions of agricultural public lands.

CHANGES IN THE PUBLIC LAND POLICY

The Philippine Autonomy Act of August 29, 1916, gave the sole power to the Philippine Legislature to legislate on matters affecting the unsold portions of the Friar Estates. Subject to the approval of the President of the United States, acts may also be passed relating to the public domain of the Philippine Islands. These provisions gave to the Philippine Legislature wider latitude than was provided in the organic act of 1902 in defining its public land policy. These powers were soon exercised. If Congress was zealous in safeguarding the Philippine public domain from outside capital, the Philippine Legislature soon proved to be more so. The passage of the Public Land Act of November 29, 1919 (No. 2874) prevented further foreign capital acquisitions of the public domain. The prohibitory limitations against foreign capital acquisitions of agricultural public land are embodied in Section 23 of the act which reads in part as follows:

> Any corporation or association of which at least *sixty-one per centum* of the capital stock or of any interest in said capital stock belongs wholly to *citizens of the Philippine Islands or of the United States*, and which is organized and constituted under the laws of the Philippine Islands or of the United States or of any State thereof and authorized to transact business in the Philippine Islands, and corporate bodies organized in the Philippine Islands

authorized under their charters to do so, may purchase (or lease) any tract of public agricultural land disposable under this Act, not to exceed * * * one thousand and twenty-four hectares.

This rigid provision of the new law was aimed directly at foreign corporations. While all agricultural corporations organized under the laws of the Philippine Islands were allowed to purchase or lease agricultural public lands under the Public Land Act of October 7, 1903, only corporations the controlling interest of which belongs to citizens of the Philippine Islands or of the United States, are allowed to acquire lands under the new land law. The public domain of the Philippine Islands was therefore closed to foreign exploitation. Reference to chart 1 will show that Japanese corporations which were organized with great activity during 1917 and 1918, ceased completely after 1919. Also a large percentage of failures by foreign corporations to obtain approval of their sales applications, as shown in chart 2, is due to the passage of the new land act, for many of those applications came under the operation of the prohibitory provision of the new law.

Under the present land laws of the Philippine Islands, only American corporations are allowed to acquire portions of the public domain. Chart 1 shows that the number of registrations of American agricultural corporations has decreased rather than increased in recent years. Tables 1 and 3 show that only a small number of American corporations have purchased and leased agricultural public lands. Their total holdings are not very extensive. Obviously, the strict limitation of area to one thousand and twenty-four hectares has not offered strong incentives for American capital to invest in Philippine agricultural enterprises. The question of pursuing a more liberal policy so as to allow a larger area has been persistently raised by those whose interests desire large agricultural holdings, as well as by a number of responsible Philippine officials. Even in the early days, the Philippine Commission repeatedly recommended to Congress to permit much larger holdings, and Governors General have held similar views on the administration of the public domain. Powerful interests in the United States have sought amendments to the present land laws so as to enable them to acquire extensive areas for development of vast plantations. But in the face of all this powerful pressure, Congress and the Philippine Legislature have stood adamant against any liberal modification of the Philippine public land policy.

SUMMARY

1. Congress by Act of July 1, 1902, enunciated a public land policy for the Philippine Islands. The fundamental principle of conserving the vast public domain for the inhabitants of the country was laid down by limitations of area which may be conveyed to corporations.

2. The Public Land Act of October 7, 1903, carried this principle into effect. Under the operation of this law, an American or foreign corporation may acquire agricultural public land not to exceed one thousand and twenty-four hectares.

3. An important change in the public land policy was made by the passage of the Public Land Act of November 29, 1919, which limits the sales and leases of agricultural public lands only to corporations the controlling interest of which belongs to citizens of the Philippine Islands or of the United States.

4. Under the operation of the land laws of the Philippine Islands, the study has shown the following:

(*a*) From 1906 to September 30, 1927, there have been organized one hundred and three American, ninety-three Japanese, and twelve other foreign agricultural corporations, or a total of two hundred and eight.

(*b*) Forty-three American corporations have acquired agricultural public lands amounting to 26,197.8 hectares.

(*c*) Thirty-seven foreign corporations, of which thirty-three are Japanese, have acquired agricultural public lands amounting to 17,839.4 hectares.

(*d*) Three American corporations have purchased from the Philippine government 22,484.5 hectares of the Friar Estates.

(*e*) The total figures show eighty-one American and foreign agricultural corporations[3] with total acquisitions of agricultural public and Friar lands amounting to 66,521.7 hectares.

5. Acquisitions of the public domain by American and foreign corporations are comparatively small, and this is largely attributed to the very strict area limitations of the land laws which have proved to greatly discourage the entrance of outside capital.

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PUBLISHED CONTRIBUTIONS OF THE COLLEGE OF AGRICULTURE: V.[1]

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Acting Dean College of Agriculture

There is not a better gauge of the mental capacity and alertness of the workers of an institution than the reports of their work published in journals of known standard. The list of contributions that follows gives a bird's eye view of the variety of problems which are the subject of inquiry by the staff of this institution.

True science aims at the classification of knowledge to render it usable and to form a basis upon which to build up further knowledge on the subject. In the early days of the College a great deal of the work was in the nature of surveys, collecting, and recording current practices in agriculture. With the growth of the institution the next logical step has been to seek to improve upon known practices and to fill gaps evident in unsystematic methods, by trying out the adaptability and applicability of known successful practices elsewhere. Having determined what methods give promise of success in the Philippine field, the third logical step to follow is to put into use such methods as have been found adapted. A great deal of the work of the College at present in its different manifestations aims at greater production and better utilization through the agency of such practices as breeding and selection and proper nutrition of plants and animals, efficient preparation of agricultural products for the market, and the control of pests and diseases of crops.

The College is still greatly hampered by inadequate support and shortage of personnel. Investigations have been prosecuted largely through individual effort and under circumstances which are at times very trying on this account. But knowledge is not found only within magnificent buildings and well-equipped laboratories. In tropical agriculture, particularly, the richest source of information is the field and here the keen observer finds pastures green where others see only a parched desert.

Appreciating the tremendous value that may come from a new principle discovered, or an old principle with a new application developed, the development of the sciences fundamental to agriculture has not proceeded in the College to the extent that would be desirable. So long, however, as there is great wealth of agricultural information that may be readily obtained, and so long as the local application of tried principles gives a rich harvest, the necessity for discovering new means of co-ordinating the different forces

[1] General contribution from the College of Agriculture No. 203.

of nature that affect production will have to be relegated to a secondary position or left in the hands of institutions with better laboratory facilities. It is hoped that with the years greater interest and stimulus in the solution of agricultural problems will merit for the College greater support. With constantly increasing competition among agricultural producers, Philippine agriculture will find it necessary to lower more and more its cost of production through increased yield or more economical methods to enable it to hold its own in the marts of the world, where most of its products have to be offered.

So long as living in the Philippines remains comparatively easy and low, incentive to greater and more economical production will be lukewarm, and many artificial obstacles will be encountered besetting the path of progress. Far-sighted statesmen, however, should be able to see through the apparent glamor and give science a chance to serve Philippine agriculture before necessity and keen competition will force the mass of the populace to demand from its scientific institutions better methods of production. This should be accomplished before actual necessity arises, as the acquisition of knowledge cannot always be hastened.

Congratulations are due to all who have contributed to make the record of the College along investigational lines noteworthy.

II: EXPERIMENT STATION CONTRIBUTIONS

The contributions are numbered serially as reported. For Nos. 1—199, *see* THE PHILIPPINE AGRICULTURIST XII, No. 7, December, 1923. For Nos. 200—287, *see* THE PHILIPPINE AGRICULTURIST XIII, No. 10, March, 1925. For Nos. 288—354, *see* THE PHILIPPINE AGRICULTURIST XIV, No. 10, March, 1926. For Nos. 355—440, *see* THE PHILIPPINE AGRICULTURIST XV, No. 10, March, 1927.

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III: GENERAL CONTRIBUTIONS

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IV: CIRCULARS

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No. 12. 1927. Wealth awaits you on the farm. Prospectus for the College of Agriculture.

No. 13. 1927. (Mimeographed) Doctor Research to the rescue. Illustrating and presenting agricultural problems in dramatic form. Prepared under direction of Department of English.

No. 14. Santos, F. O. 1927. (Mimeographed) Beriberi: its causes and prevention.

A REVIEW: "THE HOME GARDEN HANDBOOK ON GLADIOLUS"[1,2]

This book gives full information on the culture of gladiolus. Any one with very little knowledge of the plant could be successful in growing it by following the directions given. An excellent feature is the using of sketches instead of photographs for illustrations. These add to the practical value of the book. The introduction given by the president of the American Gladiolus Society is so persuasive as to induce amateur growers of the plant to become members of the society.

The first two chapters give concrete reasons for growing "Glads"; the introduction of the plant to culture in the gardens of America and other places, and its improvement. The next three chapters give complete directions for planting gladiolus. These chapters cover the selection of bulbs for planting, the location and soil requirements, propagation and propagating materials, cultivation and harvesting, and cutting and keeping of flowers. One chapter deals with the methods and practices of breeding for the creation of new varieties. Chapter VII gives extended information on the culture and method of arranging for show purposes. Gladiolus is considered one of those plants that have very few enemies. Those few enemies are well described and directions for destroying them are given in this work.

As a whole, the book gives concise information for the culture in home and commercial gardens of gladiolus; a history of the American Gladiolus Society and a catalogue for a number of the most popular varieties of gladiolus. It is well indexed.

VICENTE M. DAWIS
Of the Department of Agronomy

[1] Rackwell, P. F. 1927. The home garden handbook on Gladiolus. IX+79 p., 60 fig. New York: The Macmillan Company.

[2] General contribution from the College of Agriculture No. 202.

NOTE: THE ANDELROS CLUB

The Andelros Club, named after Anacleto del Rosario, the first Filipino chemist (born 1860, died 1895), was formed in the Department of Chemistry in the College of Agriculture in 1923. It has for its purposes: (*a*) the establishment of a close contact between the members of the faculty and the students specializing in chemistry; (*b*) the establishment of a chemical library.

The establishment of a close contact between faculty and students has been effected through discussions in seminars where abstracts of papers and

original articles are presented, and through informal social gatherings. Original papers dealing with nutrition, vegetable oils, control in sugar manufacture, and with the chemical composition of many Philippine plant and food products have been discussed at the weekly seminars.

The establishment of a library is being made possible by the annual income from "graded" fees from the faculty members and regular fees from the students. The club is now subscribing for the following journals:

Science, Industrial and Engineering Chemistry, Journal of the American Chemical Society, Chemical Abstracts, International Sugar Journal, Sugar, General Electric Review, Physiological Review, Cotton Oil Press, Chemical Review, Journal of Chemical Education.

Besides these journals, gifts, such as the back numbers of *Industrial and Engineering Chemistry, Chemical Abstracts*, framed pictures of eminent chemists, and money have been presented by members of the faculty.

The management of the club is in the hands of faculty members, there being a constitution and annual election of officers.

NICOLAS GALVEZ
Librarian, Andelros Club

EXTENSION DIVISION NOTES

A Coffee Central Project

A few months ago there was considerable agitation on the question of the establishment of crop centrals, as an abaca central, a copra central, etc. Just now, a coffee central is being planned in Lipa, Batangas. The organizer is an American capitalist by the name of Bradley Fairchild. Mr. Fairchild has been going to Lipa regularly the last few weeks interviewing men whom he wishes to make future coffee planters. Conferences are being held for the purpose of drafting a contract between the planters and the central, but at the present writing (January 10, 1928) the final contract has not yet been agreed upon. It is said that Mr. Fairchild is offering the following terms: (1) that the central will be a sort of a bank and will advance money to a planter at 12 per cent interest with his land as security; (2) that each planter will sign a contract with the central which will oblige him to mill his coffee in the central for a period of 30 years; (3) that the central will get 33 per cent of the product as a charge for milling—the planter getting the rest; (4) that the planter can sell his product when he chooses, that is, to the central or to any buyer. These are only some of the terms. They may be altered in the final contract.

Most of the Lipa farmers have not yet decided to accept these proposals of Mr. Fairchild. The Lipa coffee growers are reluctant to accept the thirty-year obligation. Experience with similar long-time contracts have made them cautious. They are also becoming careful about borrowing money when payment is guaranteed by mortgage on their land. They

hesitate to enter into a contract where there is responsibility both in producing the crop and in handling advanced capital. This hesitation shows a lack of business experience.

It is certainly a good sign that the Lipa farmers are carefully weighing the pros and cons of the proposition before coming to final decision. It is not a simple question. There are involved the revival of the Lipa coffee industry; the standardization of the coffee products; employment of labor and managerial ability; comparative profits of the growers and the central in accordance with their respective outlay; continued prosperity of the individuals and the community as a whole, as contributed by this new venture and the financial stability of the industry. These aspects of the question and others of similar nature should be taken into account. Questions of this nature need long deliberation and decision must be always made with caution.

A CATECHISM ON AGRICULTURE

1. What is agriculture?

   Agriculture, in a practical sense, is the raising of crops and live stock.

2. Does agriculture advance?

   Agriculture advances from a simple form to a more complicated form.

3. What is the simplest form of agriculture?

   The simplest form of agriculture consists of planting a patch of ground for a season or two and then abandoning it for another.

4. What is the most advanced form of agriculture?

   The most advanced form of agriculture is farm practice based on special knowledge—not a routine practice.

5. What are the two general types of farming?

   First.—General, or diversified farming. Second.—Specialized farming.

6. What is general, or diversified farming?

   General farming combines the production of plant crops with the production of farm animals.

7. What is specialized farming?

   Specialized farming is the production of one crop, usually a money crop.

8. What is the type of farming most commonly practiced in the Philippines?

   Specialized farming is most commonly practiced in the Philippines—with rice, coconut, abaca, tobacco, and sugar cane.

9. What has been the general result of this practice?

   Generally the result is poor agriculture and consequently a poor farmer.

10. What are the reasons for this result?

There are many reasons: two are: First.—Our cultivated soil becomes poor in plant food. As a result our crop yields per hectare are lower than formerly. Second.—We import every year a large amount of our food stuffs.

11. Which type of farming is advisable?

For the general welfare of the country, diversified farming is better than a one crop system.

12. Which type of farming should a farmer follow?

Each individual should determine this for himself. Each type of farming has advantages and disadvantages. It is advisable to consult experienced farmers or institutions devoted to the study of agriculture in the locality.

13. What objections are there to specialized farming?

First.—The system depends upon market and crop conditions of one crop alone. Failure of crop and failure of market brings serious disaster.

Second.—The system does not provide for the maintenance of productivity.

Third.—It fails to provide for a sufficient live stock industry to consume the waste products of the farm, and make the waste lands productive.

Fourth.—It does not provide for a system of farm management under which labor, work animals, and tools may be used to the fullest advantage.

Fifth.—It usually brings return in cash but once a year.

Sixth.—It does not produce the necessary foods to supply sustenance for the people upon the farm and keep them in health and strength.

Seventh.—It limits knowledge, narrows citizenship and does not foster home building, and does not encourage commercial farming.

14. How should farming be looked upon?

Farming should be looked upon as: First.—As a mode of living. Second.—As a business.

15. What are some of the special things that a farmer should look after, whether in specialized or diversified farming?

1. The farmer must keep his land fertile. He should do this by returning to the soil the plant food by:
   a.—Application of animal manure.
   b.—Green manuring and rotation of crops.
   c.—Judicious application of commercial fertilizers.
2. The farmer should select his seed and his breeding animals.

3. The farmer should feed his plants and animals properly.
4. The farmer should cultivate his soil thoroughly.
5. The farmer should control diseases and pests affecting his crops and protect his live stock from diseases and injuries.
6. The farmer should take good care of his farm tools and implements. He should study to improve them by devices. Good tools are an economy in labor and time.
7. The farmer should study to lower his cost of production.
8. The farmer should strive to increase his yield per hectare.
9. The farmer should always strive to sell his farm products at the highest gain.
10. The farmer should keep account of his farm expenses and income.
11. The farmer should know his labor income for his farm operations each year.
12. The farmer should maintain at least a small cash reserve.
13. The farmer should take interest in other industries affecting his own.

EXCHANGE NOTES

If the rural folk have a feeling that they are a bit inferior to other people (or to state it more correctly, that their occupation is an inferior one), it is because: first, they do not know or understand the people engaged in other types of work; and secondly, because they minimize the advantages of the farm and maximize the disadvantages. The first condition could be helped by a better social and community life. The second condition is common to most every one. Education, I believe, will do much to right these conditions.

—*Quarterly of Alpha Zeta.*

The great value of orange juice was pointed out in a paper read by Dr. Stanley Willmott at the British Pharmaceutical Conference, which recently sat at Brighton, England. "Of all citrus juices," he said, "there is little doubt that of the orange is the most valuable. It is, perhaps, the only food other than milk that can with safety be given to infants. New experiments have shown that orange juice has a much higher food value, or vitamin content, than was previously ever suspected. The chairman of the conference said the food value of oranges was remarkably high, and the use of pharmacists of the concentrated juice was a matter of importance.

—*Agricultural Journal,* (Queensland).

There was in session recently at Washington an International Soil Congress. Able and busy individuals from a score of countries found it

worth while to leave their occupations to attend this conference. The President of the United States stole time from packing his vacation trunk to address one of its meetings. All in all, it may be described as a quite respectable occasion. How different from the attitude of the grandees of a century ago toward this same soil! To them soil was a subject, as it was a substance, with which it was considered undignified to contaminate either one's hands or one's mind. The change is significant. To know the soil is now an accomplishment to be admired. Only the dictionary does not yet know this.

In the deliberations of the Washington congress the fact most impressive to the layman is the teeming life which the soil holds. The humble earthworm is an old friend, but this ubiquitous earthling is but a small part, it appears, of the soil's population. Soil bacteria were described to the congress by a dozen scientists. Professor Stoklasa, of Prague, told of how the breathing of these tiny, plantlike germs benefits the roots of higher plants: Dr. Lieske, of Berlin, presented his newest finds, soil bacteria, which can precipitate iron ore and which we have to thank, he believes, for all the deposits of this necessary ore in the world. Dr. Bristol-Roach, of the famous agricultural experiment station at Rothamstead, England, presented at the court of science some tiny living objects which she believes to be intermediate between the free-living algae which can shift for themselves in this none too kindly world and those less able parasitic plantlets, like the molds, which need some one else to prepare food for them.

One of the chief findings of modern soil science, a science the very respectability of which would have been denied in 1827, is that these living creatures of the soil are even more important to man's chief business of agriculture than is the soil's mineral substance. Among the servants of mankind not the least are these tiny, invisible ones that work so earnestly for the farmer, although he treads on them.—*Herald-Tribune* Editorial, June 21, 1927.

—*Gardeners' Chronicle* (America).

The treeless farm presents a very sorry spectacle, and one cannot fail to feel pity for the animals that are obliged to stand or lie in the broiling sun because of the absence of shade of any description.

It should be the aim of every farmer to surround his homestead with trees and to establish moderate-sized clumps in all the paddocks. Awkward corners can be utilised in no more profitable and pleasing manner than by planting them with trees.

In districts where timber for fencing and other purposes is scarce, all land that offers any difficulty in carrying on cultural operations should be planted. The investment, provided that the trees are accorded reasonable care and not interfered with by stock, will in the years to come return a very high rate of interest.

Apart from their economic and utilitarian value, trees, when judiciously arranged, add immensely to the attractiveness of a property and render it pleasingly distinctive, so that strangers in the district are immediately impressed.

—*Agricultural Journal* (Queensland).

A properly equipped University School of Agriculture must have a staff adequate to provide a sufficient variety of courses to produce the different specialists the country requires.

The great output of engineers, doctors, and lawyers from the university colleges is a direct result of the great facilities afforded for those courses. Why not, therefore, give bright young fellows in country schools the opportunity to become leaders in scientific agriculture and other great rural activities?

Agricultural education should be the concern of each type of school in the national scheme, and a great step forward will be taken when an efficient training for rural teachers has been developed, a training which will fit them to teach efficiently a course of study adapted to rural needs to the interests of rural life. No better position could be found for such a training course than in association with an agricultural college of the kind above described.

—*Journal of Agriculture* (New Zealand).

COLLEGE AND ALUMNI NOTES

Dr. Jane Varenia Lee spent a fortnight during the holiday season with her sister, Miss Caroline Virginia Lee, instructor in English Department. Doctor Lee is principal of Louola Murchison, Sprunt Academy for girls, Kiangyin, China.

Mr. H. B. Montalban, assistant chief of the Division of Fisheries, Bureau of Science, was a visitor at the College early in December for conference with Doctor Villadolid.

On December 9, 1927, the class in Horticulture of the Indang Farm School under the leadership of Mr. Catalino Acosta visited the College. They came particularly to hear lectures by some members of the Agronomy Staff. After visiting the different nurseries, the visitors attended the following lectures: "Asexual methods of plant propagation", by Dr. Leon Gonzalez, "Hybridization of pineapples", by Mr. J. M. Capinpin; "The raising and care of vegetables and ornamental plants", by Mr. V. M. Dawis.

Dr. L. B. Uichanco spent the greater part of December on a survey of sugar cane insects in the island of Negros, in co-operation with the Philippine Sugar Association.

Mr. Thongdee Resananda '24, now teaching in Agricultural Teachers' Training School in Korat, Siam, in a letter to Professor Yule acknowledges receipt of *Doctor Research to the Rescue* with words of hearty praise, and asks permission to translate parts in Siamese to use in encouraging scientific agriculture in Siam.

A second edition of *Preparation of Scientific and Technical Papers* by Trelease and Yule will soon be off the press.

Miss Wilson and Miss Whipple of English Department were Cebu visitors during the holiday vacation. They also made a trip to Lanao. Miss Lee of same department with her sister, Doctor Lee visited Silliman Institute at Dumaguete, Or. Negros. Miss Anderson, also of English Department, went to Hongkong and was fortunate in finding conditions quiet enough for her to spend a few days at Shameen, Canton.

Mr. Tomas G. Ferrer, '21, writes Doctor Uichanco from Cabagan, Isabela, in part, as follows:

I am now located in the Cagayan Valley where I am working under the Bureau of Agriculture as agricultural assistant. This is my second year in this region. I like the place and I intend to make it my permanent home. There is plenty of good agricultural public land here; I have already applied for a homestead. The people in this neighborhood are kind and hospitable. There is still plenty of room for graduates of the College who may wish to acquire land. Those who feel reluctant to go south to Mindanao may try their luck in the Cagayan Valley. Only hustlers should come, however, for there is no room here for dead timber. Labor in this place is scarce so that tenant farming would not be practicable.

Mr. Raymundo Sabado, '19, who is now a teacher in the provincial high school of Pangasinan, visited the College during the Christmas holidays.

A "get-together" of the resident members of Class '23 was held in Los Baños, December 2 to welcome back, after a three years study in the United States, Alexander Gordon, a popular member of this class. Mr. Gordon obtained Ph. D. degree from Cornell. The members of '23 present were Messrs. Calixto Zamuco, Pablo Mabbun, and José B. Juliano.

Mr. Ramón P. Tolentino, Jr., assistant director, physical education, makes the following report on activities for the College year.

Baseball

The U. P. Manila Colleges' Baseball Team won this year's University Championship by defeating the strong U. P. Los Baños Colleges' nine in two straight games, 4-0, and 4-2. Better all-around playing was responsible for the rather easy victory of the city team over the aggregation composed mostly of Aggies.

Basketball

U. P. Los Baños came in to its own again when in the University Championships for this year it won once more the U. P. Basket ball title. The Los Baños cagers have been U. P. champions for five consecutive years (1921–1925); the Manila colleges, for two years (1926–1927). In this year's basket ball games, both teams were evenly matched. U. P. Manila won the first game by the close score of 29–27. U. P. Los Baños came back strong and took the second and third games by comfortable margins, the scores being 43–38, and 49–36, respectively.

Relay Carnival

The U. P. Unit IV, or the U. P. Los Baños Colleges' relay team, last year's champion, was unable to defend successfully its title this year. The U. P. Unit II (College of Liberal Arts) relay team won this athletic event by scoring 42 points against 38 of U. P. Los Baños. Unit I (Law, Medicine and Engineering) was third with 10 points. Unit III (Education) withdrew from the race.

Tennis

Roberto Betia, a senior in the College of Agriculture and last year's U. P. Los Baños Colleges' tennis singles winner, won again this year's tennis singles championship. In the finals, he faced and defeated in straight sets Charas Suebsaeng, a Siamese student of the College of Veterinary Science, by the score 6–2, 6–0, 15–13. S. L. Sison, C. Sundarasinha, R. Ordoveza, Magno, and J. Austria also showed up well in this tournament.

Intramural Athletic League

Likewise, in tennis doubles, history repeats itself. R. Betia and J. Austria, last year's winning pair, captured the 1927-1928 tennis doubles championship. They defeated R. Ordoveza and S. L. Sison in the finals, the score being 7-5, 7-5, 6-2.

The end of the 1927-1928 season shows the Freshmen (C. A. '31) of the College of Agriculture carrying the general championship honors in the U. P. Los Baños Athletic League by filing up a total of 233 5/6 points as against the 169 points made by the Seniors (C. A. '28), their closest rivals.

C. Alkan, Inc., donated a silver loving cup to the general champions and a pennant to each of the winners of the different events in the league.

Results of the League games are as follows:

Place	*Team*	*Total of points*	*Championship*	*Prizes*
1st	C. A. Freshmen	233 5/6	Soccer Football	General championship silver cup pennants and
			Intramural	victory trophy.
			Track and Field	Silver medal (to Severino Martinez—highest individual point winner.
2nd	C. A. Seniors	169	Basket ball	pennant
			Relays	pennant
3rd	C. A. Sophomores	147		
4th	C. A. Preparatory	143	Volley ball	pennant
5th	Veterinary	88 5/6		
6th	C. A. Juniors	82 1/3		
7th	Forestry	21		

The 1927–1928 U. P. Los Baños Athletic League ended its 1927–1928 Season at the Christmas holidays. In former years, games were played between department teams. This year, under the new organization plan, the teams represented each of the four classes of the College of Agriculture, the Preparatory classes, the School of Forestry and the College of Veterinary Science. A keen rivalry resulted and the athletic league enjoyed a lively season of good fast games. To Mr. Ramón P. Tolentino, Jr., Assistant Physical Director, to the class coaches and captains and to appointed games officials goes much credit for the well-managed program of games marked by good feeling and well-trained players.

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